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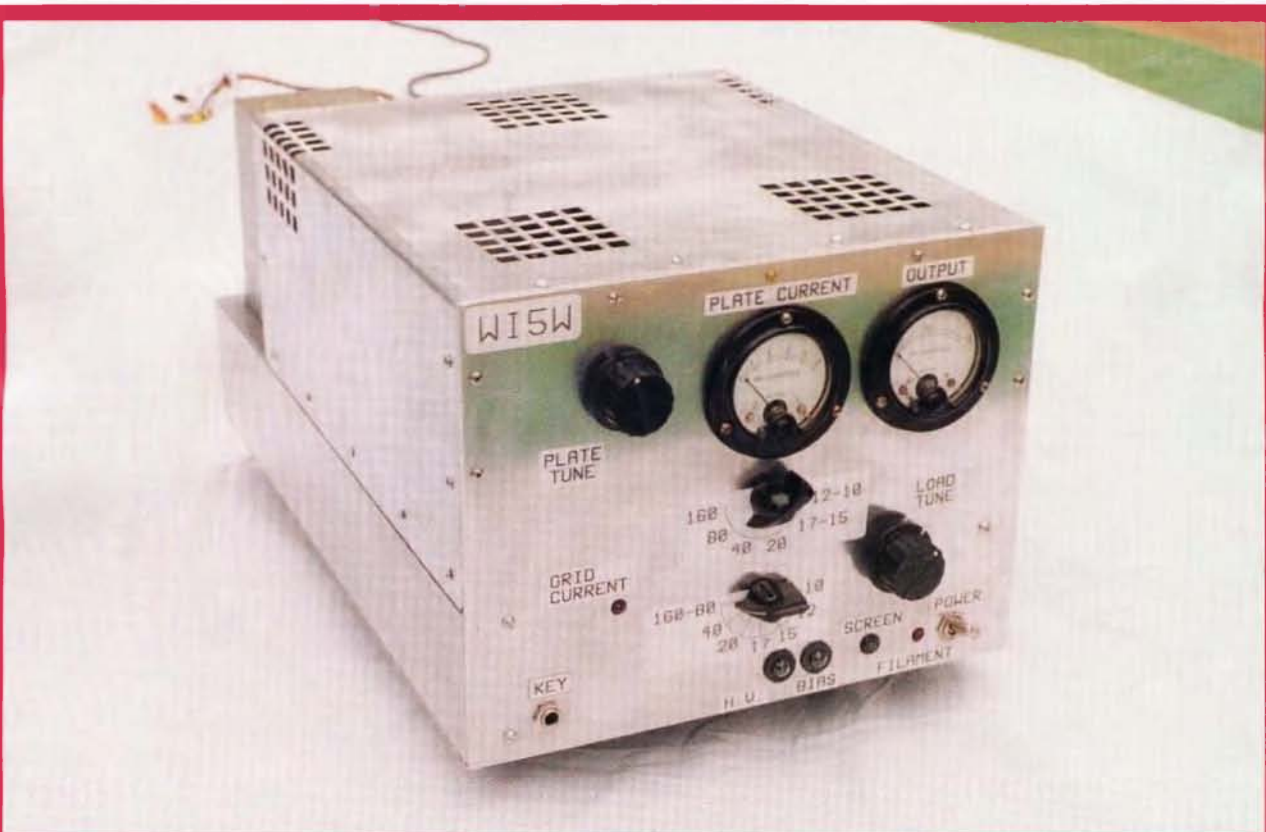

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JANUARY 1999
ISSUE #460

73® Amateur Radio Today

TABLE OF CONTENTS

FEATURES

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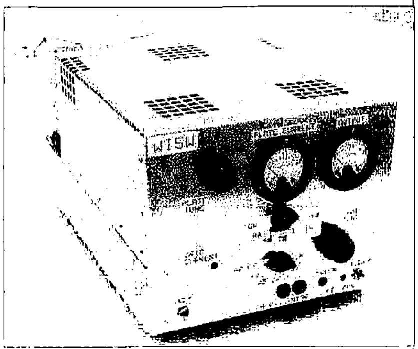
DEPARTMENTS



On the cover: This monster awaits you on page 10. Photo by WI5W. Don't forget: You, too, can win a little fortune and a lot of fame by submitting your cover photo candidate—with or without article. You mean you couldn't use a little extra cash?

Feedback: Any circuit works better with feedback, so please take the time to report on how much you like, hate, or don't care one way or the other about the articles and columns in this issue. G = great!, O = okay, and U = ugh. The G's and O's will be continued. Enough U's and it's Silent Keysville. Hey, this is *your* communications medium, so don't just sit there scratching your...er...head. FYI: Feedback "number" is usually the page number on which the article or column starts.

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Number 1 on your Feedback card

NEVER SAY DIE

Wayne Green W2NSD/1

Peoria!

Yep, Wayne Green played Peoria again! And I had a great time. Too bad if you were within driving distance and missed it. The Peoria Superfest '98 was a humdinger. If I'd driven there my car would have been packed to the gills with some of the great stuff I saw being sold. Lordy! Video cameras for $20, great bargains on coax, Apple II™ computers with monitors that looked like they were right out of the carton from the factory for $30. Sigh. I could have filled a van at those prices. And the flea market stretched on in every direction. Tables of old tubes, and anything you could ever want in parts.

The Wayne Green fans (yes, there are still a few left) got their ration of my views on things. I spoke for an hour and a half on Saturday afternoon, and then again for it must have been an hour (but who was counting?) at the banquet that evening. Then for another hour Sunday morning.

The hamfest was held at the local fairgrounds, with the exhibits and forums being in the usual fairgrounds exhibit buildings. On Sunday, right in the middle of my talk, the rain let loose. It sounded like someone dropping a few tons of lead shot onto the tin roof. It did this a couple of times and then went away. Later I found where the storm had gone, as Chicago's O'Hare Field was closed down, delaying my trip back to New Hampshire by three and a half hours. The terminal at O'Hare was wall-to-wall passengers waiting out the delays. The lines at McDonald's never got under 15 deep, with hundreds of people sitting on anything handy, working diligently on reducing their life spans with burgers and fries.

When word got out that I was going to be coming to Peoria, the folks at the Rockford (Illinois) club went to lengths to get me to stop off there and give a talk. Instead of flying to Chicago and then on to Peoria, they picked Sherry and me up in Chicago and drove us to Rockford. We had dinner at a wonderful buffet restaurant and then I talked to the club. And talked. And talked. Well, no one dozed off, and the hands were up all over the place with questions.

The next morning they drove us to the airport, where they had hired a Mooney (it's a small plane, not a religion) to fly us to Peoria.

During the whole trip we were treated like royalty. I could get used to that. At Peoria they even had distilled water for me at both the Friday night dinner with a few club members and at the Saturday banquet.

I talked about the day that Khrushchev saved amateur radio. Yes, I was right there when it happened! And I talked about the greatest catastrophe in the history of the hobby. I also talked a lot less than I'd have liked about my approach to answering the FCC's questions about restructuring the hobby. Well, I kept getting off on tangents, just like I do with my editorials.

Basically, I'd like to see the FCC have a 5 wpm test for all classes of license. Second, I'd like to see all classes of license done away with and there'd be just one license for everyone. This silly business of making us memorize a bunch of Q&As to pass a test for upgrading doesn't make any sense to me. That doesn't teach anyone anything. You learn mainly by doing, so we should make the entry into the hobby easy and then do our best to get as many hams as possible interested in packet, RTTY, slow scan, satellites, and so on. If we get 'em into DXing they'll be learning about antennas. It's about time we got some pioneering done with HF packet anyway. We should be developing ways to get that creepy-crawly stuff up to speed. Ditto RTTY. Oh well, RTTY was 60 wpm when I got interested 50 years ago — now it's up to a mighty 100, the last I heard. Snore. Our computers can discuss things at 50,000 wpm. That's even faster than we can read — although, when I get the time, I have a speed reading course here that guarantees I'll be able to read 25,000 wpm, and with better retention than I have now.

License Drop

The August 1998 FCC license figures compared to 1997 show a continuing drop in Techs upgrading to General and Advanced licenses. There was a drop of 26% in upgrades to General and a 28% drop in upgrades to Advanced. The 1997 figures *vs.* 1996 showed only a 10% drop in General Class upgrades, so the drop is escalating. The overall decrease in upgrades has gone from 17.8% in 1996 to 22.2% in 1997 and 27.3% in 1998.

The numbers may not mean much to you until you plot them on graph paper. They form a fairly straight line, indicating that unless something changes, 1999 will give us a 33% further drop, 2000 a 39% drop over that, and 2001 a 45% drop over that.

The Bad News

The September FCC license figures show an even faster drop in new licenses, with an overall loss of licensed hams. General licenses dropped by 2953 from a year ago. Advanced dropped 2459 and Novices by 7678! The only significant increase was Techs, by 11,550. This tells us that a bunch of Generals and Advanced have dropped out of the hobby and not even bothered to renew their tickets. Others, of course, died. But, worst, the Techs are *not* upgrading. It just isn't happening.

Not to be a pest, but the next time an ARL official shows his face at your club you might ask him what in hell the Little League plans to do about this situation. I sure haven't heard anything about any plans, but then what do I know? No, that missing R *isn't* a typo. The day of message relaying is long gone, so let's forget the Relay part of their name, which is as in tune with the times as CW. Yeah, packet *is* relaying, of a sort. But show me where the ARL is a big packet supporter.

In the 1920s, when we were down on 100 meters and using spark, the only way to get a message very far was by relaying it. Then came CW and the League message handling nets which solicited unimportant messages and relayed them for the fun of it, with involved hams making like small Western Union stations. I used to enjoy how long it took messages to get through this system, and how bungled they'd get in the process.

When RTTY came along

Continued on page 6

LETTERS

Number 6 on your Feedback card

From the Ham Shack

Gene Lynch WA7ZRA. Box 567, Boulder MT 59632. Hi, Wayne: I suspect you don't remember me. I am the person who built the Karlson speaker cabinets about twenty years ago. I still have them and they still perform better than anything I've heard since. I still have the plans, and copies are available for anyone who wants them. Just send a large SASE. Make that two stamps.

This is a good deal! There is no speaker enclosure on the market today that can equal the Karlson. — Wayne.

Bill Nielsen KØQHF. As a fellow ham who got into reading *73 Magazine* back with issue number 1, I enjoy reading your editorials. In a recent editorial you touched on the subject of religion, so I thought I would tell you about three very interesting books I have read on the subject. You may want to read them, as they show the modern-day churches for what they are. The books: *The Forgotten Books of Eden*, Bell Publishing Company; *The Lost Books of the Bible*, also published by Bell; *Deceptions and Myths of the Bible*, by Lloyd Graham, also published by Bell. Give 'em hell, Wayne. You may not please everyone, but you sure as heck get them to think a little.

Maybe. — Wayne.

Darryl Jones VK2YDJ. Wayne, I enjoyed your *Sightings* interview and I always look forward to your Never Say Die. Perhaps with Y2K now becoming the issue it truly is, this is an excellent moment to lobby hard to have Morse dropped to bring in more amateurs and open the HF to all existing hams. We may need all the backup communication we can get come Jan. 1, 2000. Maybe you can get the hams to lobby their senators and congressmen. Keep up the good work.

At the speed things work in Washington, we should have started this push five years ago. We'll all see how Y2K plays out. More and more experts on the subject are predicting chaos. — Wayne.

Ken Dupuis WN2SQC. In all honesty, I enjoy *73 Magazine* very much and have for over three decades. The part I enjoy most is your editorials, I mean it, and I actually pull back issues to read for the nostalgia effect, but mainly for your editorials. It's like a refresher course in common sense. I was also pleased to see that ICOM America got its senses back and renewed their effort to support the best ham magazine in print. As you have pointed out so often, it takes advertiser dollars to print reader information. More bucks, more pages. Now I'm glad my new rig is an ICOM. I was also going to get a new ICOM for the XYL but the guy in the ham store wouldn't trade. After thirty-some years of editorial brainwashing I finally took your advice to heart. I quit my high paying, do nothing government job with the unbelievable bennies and used my collective knowledge (?) to advance my station in life. Unfortunately, it didn't work. I am now unemployed, broke, living in my car, and will have to pick up empty beer cans to pay for the stamp on this envelope — thanks a lot. The good news is that the beer cans are all over the floor so it's pretty easy to collect enough for a stamp. The bad news is that I can't bend over my fat gut to pick them up, so I will have to keep the next six-pack of empties handier. I built a bioelectrofryer and tried it on the family cat. Wow, no more fleas and no more cat. My old tired eyes thought it read 27 volts output when it was 270 volts. Oh well, I didn't like the cat much anyway. All kiddin' aside, keep up the good work!

NEVER SAY DIE

continued from page 4

in 1948 the ARL fought it fiercely. It took years of fighting the League to get the FCC to okay the use of RTTY on the HF bands. They pulled every trick they could think of. Well, they were afraid it would put their old CW network out of business with the RTTY ability to handle traffic at 60 wpm with no errors.

I think I really scared them when I set up an RTTY station on 42nd Street a half block from Times Square in Manhattan one Christmas and handled thousands of Christmas messages to our troops overseas. I made the cover of *CQ* magazine, with Bill Halligan W9AC and Faye Emerson and Skitch Henderson. I also made the Brass Pounder's League. Maybe they thought my teletype machine had brass keys.

It is the League's job to get the hobby going again. Prizes for anyone who can figure out how to wake up the directors and get them to do what they've been elected to do.

Doom!

Art Bell (W6OBB) had "Dr. Doom," Ed Dames, on his show again. It seems like Dames and Scallion (K1BWC) are trying to outdo each other in predicting doomsday scenarios. Dames said that the Y2K computer bug is not going to be a major problem ... because most of us will be dead before then. Well, it's nice that we can stop worrying about Y2K.

Dames has a group of "remote viewers" who have been busy checking out the future to see what it holds. Since scientific research has proven beyond any question that in some way we *are* able to predict the future (as I've reported before ... have you read *The Conscious Universe* by Radin yet?), I can't dismiss Dames' predictions lightly. Dames started out in this field with a group that was doing remote viewing for the military. He is now selling a course which teaches anyone interested how to do it. Golly, I wish I had the time to check that out!

Anyway, Dames is predicting that a major solar flare next April will fry most of us. Well, the Sun has been acting very strange lately, with increased UVs burning up crops and bewildering bees so they can't pollinate plants.

Dames also predicted that this fall the stock market is going to crash ... that stock markets all around the world are going to crash. Considering how volatile they are, and the weakness of their foundation, this isn't a far reach. Like banking systems, where over 90% of the money is lent out, even a small run on the banks can crash the whole system.

Look at what's happened with the Tokyo market, which was artificially built up, based on ridiculously high land values. When the air went out of that balloon drastic measures were called for ... and *not* implemented. So the fundamental weakness of the Japanese market is still a potential disaster which could bring down one market after another around the world. Remember, the Japanese have hundreds of billions invested in American companies and our government securities. A crash in Japan could result in frantic calls to liquidate these investments and, like our banks, there isn't any money there, just debt. All it takes is a small movement to get out of the market and to cash in government securities, and poof, the whole debt system can crash. And since 10 million or so people tune in to the

Continued on page 56

QRX . . .

Number 8 on your Feedback card

Ham Scholarships Available

The Foundation for Amateur Radio, Inc., a non-profit organization with headquarters in Washington, DC, plans to administer 66 scholarships for the academic year 1999–2000 to assist licensed radio amateurs. The Foundation, composed of over 75 local area amateur radio clubs, fully funds 10 of these scholarships with the income from grants and its annual Hamfest. The remaining 56 are administered by the Foundation without cost to the various donors.

Licensed radio amateurs may compete for these awards if they plan to pursue a full-time course of studies beyond high school and are enrolled or have been accepted for enrollment at an accredited university, college, or technical school. The awards range from $500 to $2500, with preference given in some cases to residents of specified geographical areas or the pursuit of certain study programs. Clubs, especially those in Delaware, Florida, Maryland, New Jersey, Ohio, Pennsylvania, Texas, Virginia and Wisconsin, are encouraged to announce these opportunities at their meetings, in their club newsletters, during training classes, on their nets and on their World Wide Web pages.

Additional information and an application form may be requested by letter or QSL card, postmarked before April 30, 1999, from:

FAR Scholarships
P.O. Box 831
Riverdale MD 20738

The Foundation for Amateur Radio, incorporated in the District of Columbia, is an exempt organization under Section 501(C)(3) of the Internal Revenue Code of 1954. It is devoted exclusively to promoting the interests of amateur radio and those scientific, literary, and educational pursuits that advance the purposes of the amateur radio service.

Wayne on RAIN

Well-known (possibly notorious) amateur radio columnist and publisher Wayne Green W2NSD/1 has agreed to host a free-form op-ed feature for RAIN, the Radio Amateur Information Network, on its Web site [www.rainreport.com]. Dubbed "Wayne Green Pontificates" by Green himself, this weekly unscripted diatribe will provide an audio outlet for Green's diverse opinions, that, as he put it, "will range from amateur radio to good health, wealth, and wisdom." According to Executive Producer Hap Holly KC9RP, "Most of us in the blind and visually impaired community have had limited access to Green's provocative and thought-provoking writings. Now anyone on the Internet with Real Audio 3.0 capability can hear him expound weekly on the topic(s) of his choice. I've given him free rein, editing nothing but my voice; however, I have suggested he keep his chats to 10 minutes or less. How delighted we are that Wayne Green Pontificates (WGP) is Wayne's first audio column!"

Updating Fridays at [www.rainreport.com], WGP is licensed to Bohnhoff MediaCasting for Internet distribution and archiving. Intended for Web listening only, WGP is the brainchild of RAIN webmaster Mark Bohnhoff WB9UOM. "I have been benefiting from Wayne's column in *73 Magazine* ever since I developed a health problem a few years ago. I am pleased that Wayne has agreed to take the time to share his expertise with the Internet listener."

As Hap Holly says, "We are delighted Wayne has decided to get his feet wet with RAIN."

New Element Discovered!

The heaviest element known to science was recently discovered by GM research physicists. The element, tentatively named Administratium, has no protons or electrons and thus has an atomic number of 0 (zero). However, it does have one neutron, 125 assistant neutrons, 75 vice neutrons, and 111 assistant vice neutrons. This gives it an atomic number of 312. These 312 particles are held together by a force that involves the continuous exchange of meson-like particles called morons.

Since it has no electrons, Administratium is inert. However, it can be detected chemically as it impedes every reaction that it comes in contact with. According to the discoverers, a minute amount of Administratium caused one reaction to take over four days to complete when it would have normally occurred in less than one second. Administratium has a normal half-life of approximately three years, at which time it does not actually decay but instead undergoes a reorganization in which assistant neutrons, vice neutrons, and assistant vice neutrons exchange places. Some studies have shown that the atomic mass actually increases after each reorganization.

Research at other laboratories indicates that Administratium occurs naturally in the atmosphere. It tends to concentrate at certain points such as government agencies, large corporations, and universities, and can usually be found in the newest, best appointed, and best maintained buildings.

Scientists point out that Administratium is known to be toxic at any detectable level of concentration and can easily destroy any productive reaction where it is allowed to accumulate. Attempts are being made to determine how Administratium can be controlled to prevent irreversible damage, but results to date are not promising.

From Winter 1998's *Passband*, newsletter of the Onslow ARC, Jacksonville NC, Robert DeVega Jr. KF4VOM, editor.

Digital Weather Reporting on the Horizon

As anybody involved in the emergency and public service aspects of ham radio knows, the participation level that we'd like to see is not always there ... shortage of personnel is a real problem. Aside from that, more people can often help alleviate a problem, but it's no guarantee of a full "fix." After all, there are only so many people who can sit at a net control desk at the National Weather Service, and there are only so many voice repeaters that can be used in reporting.

Packet radio has been contemplated as an addition to our system [in Green Bay, Wisconsin] for the past few years, as a way to handle the less critical traffic with some degree of automation. While these reports still are important to us, they are not of critical time-value in nature. The report of a tornado, funnel aloft, or wall cloud certainly requires the speed that only voice reporting can provide. After-the-fact damage reports or heavy rainfall reports can be passed on a little later. There are also instances where a net control operator cannot instantly appear at the NWS to operate a net.

The Wisconsin packet radio network is reaching the stage where it will soon be practical for secondary or absentee reporting. The system that will be in place will have a computer operational 24 hours a day, with the ability to give information to users and get information from them. The user interface will be (or at least resemble) a BBS. It will be configured to print out any reports at any time, so that meteorologists will be able to simply tear off the report and keep it on file. There will be no direct interaction with the meteorologists; after all, even if one were available and licensed, he or she cannot operate because he or she is on duty and being paid. There will also be little interaction with the Net Control Operator, mostly because he or she will be actively operating the voice net. Keyboard chats with the NCO will not be needed to file a report.

Another feature of this system will be the ability to get timely information concerning the exact nature of any watches or warnings that have been posted for the Central Warning Area that we cover. This will allow county NCOs to get updated information without interrupting the flow of the net.

From an article in *The Wisconsin Packeteer*, Andy Nemec KB9ALN, editor; included in *Badger State Smoke Signals*, July 1998, Jim Romelfanger K9ZZ, acting editor.

Home-Brew a Customized HF Amplifier

Visualize, contrive, create!

Randy L. Henderson WI5W
10809 N.E. 17th Street
Oklahoma City OK 73141
[www.flash.net/~randylh/]

As many hams have discovered, building a vacuum tube-based RF power amplifier is still a good way to save money while creating a valuable station accessory. This project embodies a number of interesting ideas.

The amplifier described here allows me to substantially boost the output power of my HF station, yet my out-of-pocket expenses were a fraction of what I'd have needed to buy a commercial equivalent. I used all kinds of money-saving strategies.

On-the-air operation has resulted in comments of "very good" and "excellent" SSB signal quality. Some of the ideas I used in designing this amplifier may not appeal to everyone, but perhaps you will find one or more of these techniques helpful in your own project.

One money-saving strategy involves something other than the amplifier itself. Specifically, a transceiver or transmitter capable of 10 W or more can drive this amplifier to full output. I use it with a small multiband home-brew transceiver (described in my book, *Build Your Own Intelligent Amateur Radio Transceiver*, McGraw-Hill, 1997).

Other specifications of the amplifier include a maximum output of approximately 800 W. Input VSWR is very low, making it easy to drive with even the "pickiest" of exciters. It is capable of break-in keying (QSK) for CW, or reasonably fast turnaround T/R switching for data modes.

This is not a grounded-grid (cathode driven) amplifier. It uses a tetrode with the cathode bypassed to ground by capacitors. The cathode is 500-V negative with respect to chassis ground.

Other clues about the inner workings are apparent on the front panel in **Photo A**. Neon bulbs indicate the presence of grid-bias and plate voltage. Light-emitting diodes (LEDs) indicate control-grid and screen-grid current as well as filament voltage. Meters indicate plate current and RF output current.

Band-switching is accomplished with two separate switches for input and output circuits. Yes, this is a bit unsophisticated, but it's also simple and inexpensive. The jack labeled "KEY" at the lower left corner is a cost-related feature that ties in with issues related to T/R switching and relays.

The large pi-network coils and plate chokes in this project are fabricated by hand at a considerable savings over buying new ones. I even made the variable capacitors in the pi-network. If this seems too labor-intensive, wait until you see how they're constructed. The design is simple and easy to copy.

Circuit description

Except for the plate and screen supplies, the entire amplifier circuit including bias and control is shown in **Fig. 1**. Transmit/receive switching is accomplished by K1 and K2. The control-grid bias voltage changes from standby to operate mode when the contacts of K3 close.

The input signal is applied to the control grid. The screen grid is at RF ground as it would be in a conventional grounded cathode amplifier. An important difference here is that it is also at DC ground. I originally saw this idea in a VHF amplifier in the *1989 ARRL Handbook*. It offers the possibility of excellent input-to-output isolation because the screen grid sees a very low impedance to ground over a wide frequency range.

The control grid is supplied with bias through R8 which also acts as a load for the exciter. Loading the grid

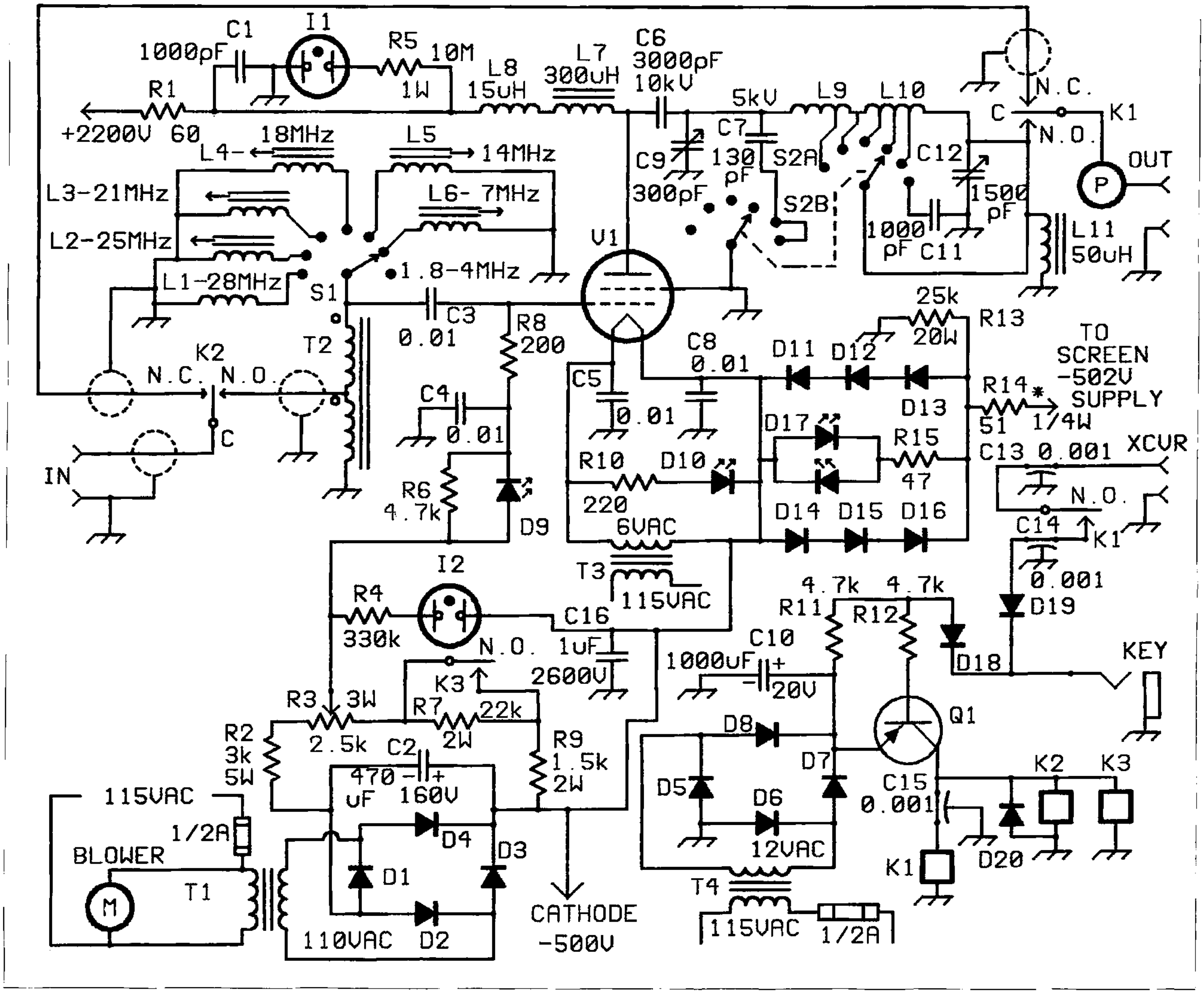

Fig. 1. For instructions on how to fabricate C9 and C12, see text. Diodes D11 through D16 are used only to protect the bicolor D17 LED from overloads. Values for L1 through L6 are chosen to form a parallel resonant circuit with the combined grid and socket capacitance of 110 µF. L9 is formed into a 1.7-inch (ID) coil. Wind six turns over a length of two inches.

helps dissipate the very small amount of output energy that finds its way back to the input. This also lessens the chances of parasitic oscillations occurring.

The 200-ohm load presented by R8 is transformed to one-quarter of that value by T2 for matching the 50-ohm output of an exciter. There is enough inter-electrode capacitance at the control grid and socket to cause an input mismatch on the higher bands. Coils L1 through L6 are switched in to cancel this capacitive reactance at 7 MHz and higher.

These input-coil values may have to be different if you use a different tube. Each forms a parallel resonant circuit with the combined tube and socket capacitances.

I used a low-current LED at D9 for grid current indication. It shows some illumination at 0.5 mA and is at almost full brilliance at 2 mA. When operating the amplifier in a linear manner, D9 lets me know if the drive level is too high. As soon as the grid is driven positive, D9 lights.

Screen current is supposed to be close to zero, or slightly positive, with the output properly loaded. D17 suffices for knowing if the screen current gets into a region high enough to exceed the screen dissipation rating. At least it will look excessively bright under such conditions. I have it connected to glow green with positive screen current, and red with negative screen current. This is one indicator where you should consider using a meter if you are paying very much for your tubes.

As for tubes, the 8791 is not really a common, inexpensive tube unless you happen to get some as "pulls" from a broadcast transmitter. A new socket for this coaxial-base tube is also rather expensive. I fabricated a suitable socket from sheet brass and PC-board laminate.

A number of tubes would be good candidates for use in this circuit. The 4CX800 and 4CX1000 are close to what I used, although you will need to get data about the necessary screen, control grid, plate and heater voltages.

I used a single transformer with two secondaries for the grid bias supply and

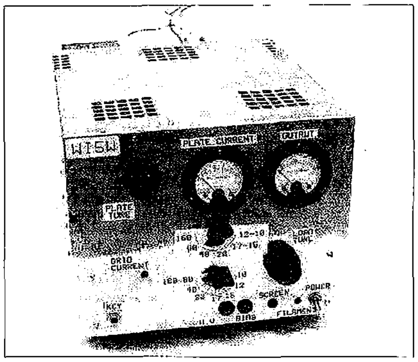

Photo A. The U-shaped top cover is salvaged aluminum and was formed using steel angle stock clamped to the work bench. The final angles of the corners were hammered into shape.

heater. You could certainly use separate transformers as shown in **Fig. 1** for T1 and T3. The control-grid bias supply uses a full-wave bridge rectifier.

The whole bias supply "floats" with no part of it connected directly to ground. Therefore, it is important that the insulation of T1 and T3 secondaries withstand the full screen voltage.

Timing and control

Controlling this amplifier in a slightly unconventional manner allowed me to use another low-cost part. Some amateur stations switch the amplifier from receive to transmit mode by a voltage or contact closure that comes from the exciter, usually a transceiver.

I think it makes more sense to have the amplifier control the exciter. That's the reason for the front-panel jack labeled "KEY." Regardless of the keying source (straight key, automatic keyer, computer, mike button, TNC, etc.), the amplifier has time to get its "affairs" in order before the exciter generates a signal on key-down (the start of a transmission).

The terminal in **Fig. 1** labeled "XCVR" keys the transceiver. This arrangement means that you can use a variety of ordinary relays for K1, K2 and K3.

Because of the seemingly unusual cathode and screen circuitry, I thought it might be helpful to clarify the amplifier supply requirements with **Fig. 2**. My setup is the **(a)** version. This is probably the easiest way to power the amplifier, because the screen supply is not required to deliver high current levels. The circuit at **(b)** requires that the full plate current, plus screen current, are available from the screen supply, with good voltage regulation. The screen grid in a tetrode amplifier is sensitive to voltage fluctuations. It does offer the advantage of requiring less voltage from the plate supply and may be worth considering if you happen to have parts for a very hefty (500-V in this case) supply. For a detailed description of the supply I'm currently using, see "Build a High-Voltage Power Supply at Low Cost" in the January/February 1998 issue of *QEX Forum for Communications Experimenters*.

Construction

Removing the bottom cover reveals a rather spacious layout in **Photo B**. In general, DC circuits and RF input circuits are contained in this area. Where conductors must pass through to the top side of the chassis, shielded cable and bypass capacitors are used for isolation.

At the bottom of **Photo B** is R3, the bias control on the back panel. To its right is a large hole for the blower. The large resistor running along the right edge of the photo is R1, used to give protection against tube flash over. Above the blower hole is T4 and its associated 12 VDC power supply components mounted on a copperclad board. I made the rectangular pads on the board by clamping it in a vise and raking a sharp marking punch along the straight edge of the vise jaws.

Another small circuit board below and to the left of the 12 V supply is the bias supply. At the upper left corner is the tube socket with various grid-circuit components mounted to its left. Input coils L1 through L6 are mounted at center top, next to the front panel.

A closer look at **Photo C** makes it easier to identify some of these input components. Components on the copperclad board include C3, C4, K3, R7, R8, and T2. Bypass capacitors C5 and C8 are the large mica units connected to the homemade tube socket.

All of the plate-circuit RF components are located topside in **Photo D**. I placed the blower and filament/bias transformer outside the RF-output enclosure in an apparently successful attempt to reduce unwanted feedback and RF radiation. The tube chimney is made from a food container that the manufacturer touts as "microwave oven-safe." The chimney diameter is larger at the bottom where it is attached to the chassis and tapers to a

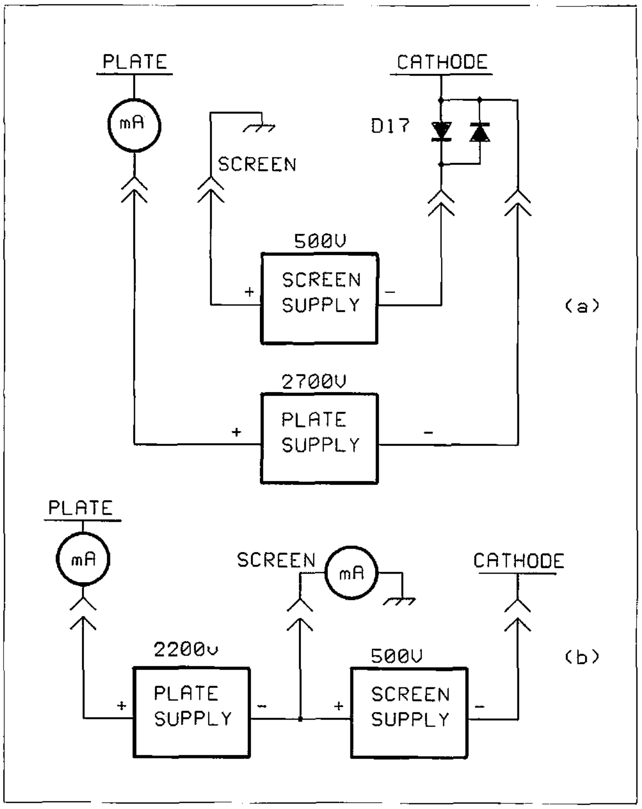

Fig. 2. Two possible methods of powering the amplifier are shown here. You can substitute a meter for D17 if you wish. Plate current can also be monitored by putting the meter in the negative lead of the 2700 V supply in (a) or the 2200 V supply in (b). This reduces the insulation requirements of the meter housing and face.

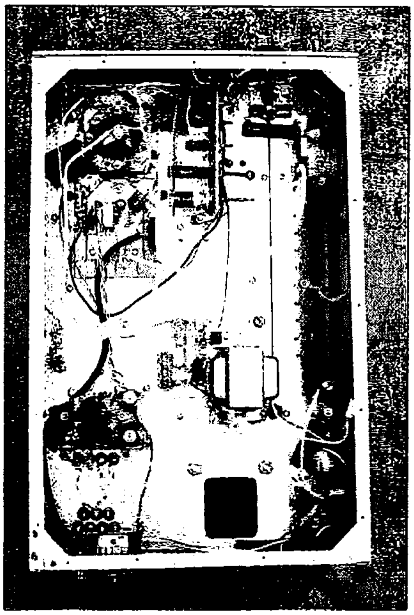

Photo B. The mechanism for the LOAD TUNE knob is near the front panel. Part of the knob can be seen alongside the toggle switch handle in this photo. The mechanism includes a small bracket made of sheet copper soldered to a 1/4-20 nut. The bracket bears against the chassis to prevent rotation of the nut. It also has a small hole drilled in it for attaching the dial cord. A washer has been fastened to the threaded end of the decapitated LOAD TUNE bolt and the PLATE TUNE bolt to act as a stop to prevent completely unscrewing the nut. I drilled and tapped the ends to accommodate a small screw for this purpose. R3 is mounted on the back end of the chassis for ease in adjusting control-grid bias.

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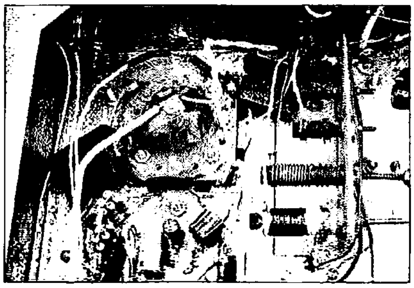

Photo C. This is a closer look at the surroundings of V1. The homemade tube socket is a story in itself. Alternating layers of 0.010-inch sheet brass and unclad glass-epoxy board are used to make the supporting structure and contacts. The ventilated brass sheets and a small finned heat sink help cool the tube base.

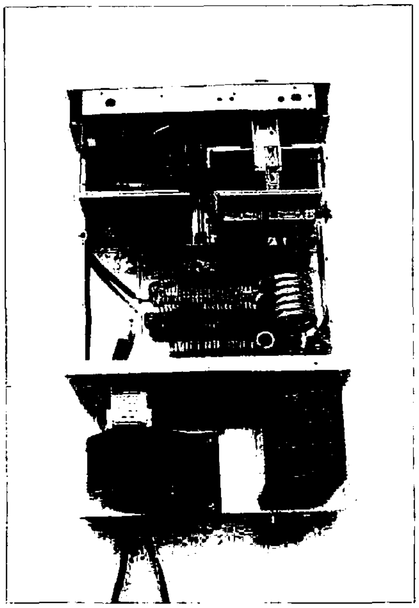

Photo D. Copper braid from RG-59 coaxial cable is used for connections between the tank coils and band switch. A long shaft extension from the band switch is used to make part of S2B. A movable contact made from brass sheet soldered to a knob insert is mounted on the shaft extension. It rotates against a fixed brass contact mounted on a standoff insulator connected to C7.

smaller diameter at the opening around the tube cooling fins, allowing me to place holes in the chassis around the tube socket for decreased back pressure and increased air flow.

Pi-network components

Both plate tank coils are handmade. The smaller L9 is made of quarter-inch copper tubing. The strips you see in **Photo D** supporting the coil turns in L10 are made of epoxy-glass circuit board material with the copper foil removed. Polyester resin, available in hobby stores and auto-supply houses, holds the wire in place on the strips.

Another money- and space-saving feature in this amplifier includes C9 and C12, the output pi-network capacitors. You have probably seen small compression trimmer capacitors that squeeze together two metal plates separated by a solid dielectric. Well, C9 and C12 are sort of an overgrown version. They are the large metal plates standing vertically and parallel to the front panel in **Photo D**. The variable capacitor at the upper edge is C12. Minimum capacitance for these capacitors is lower than values attainable with conventional air-dielectric variables.

An edgewise view of this capacitor in **Fig. 3a** shows how one plate is pivoted away from the other by tension from a dial cord. The dial cord for C12 passes to a small pulley at the back of the tank circuit enclosure, through the chassis deck and returns underneath to a threaded nut near the front panel. A 1/4-20 bolt, threaded into this nut, passes

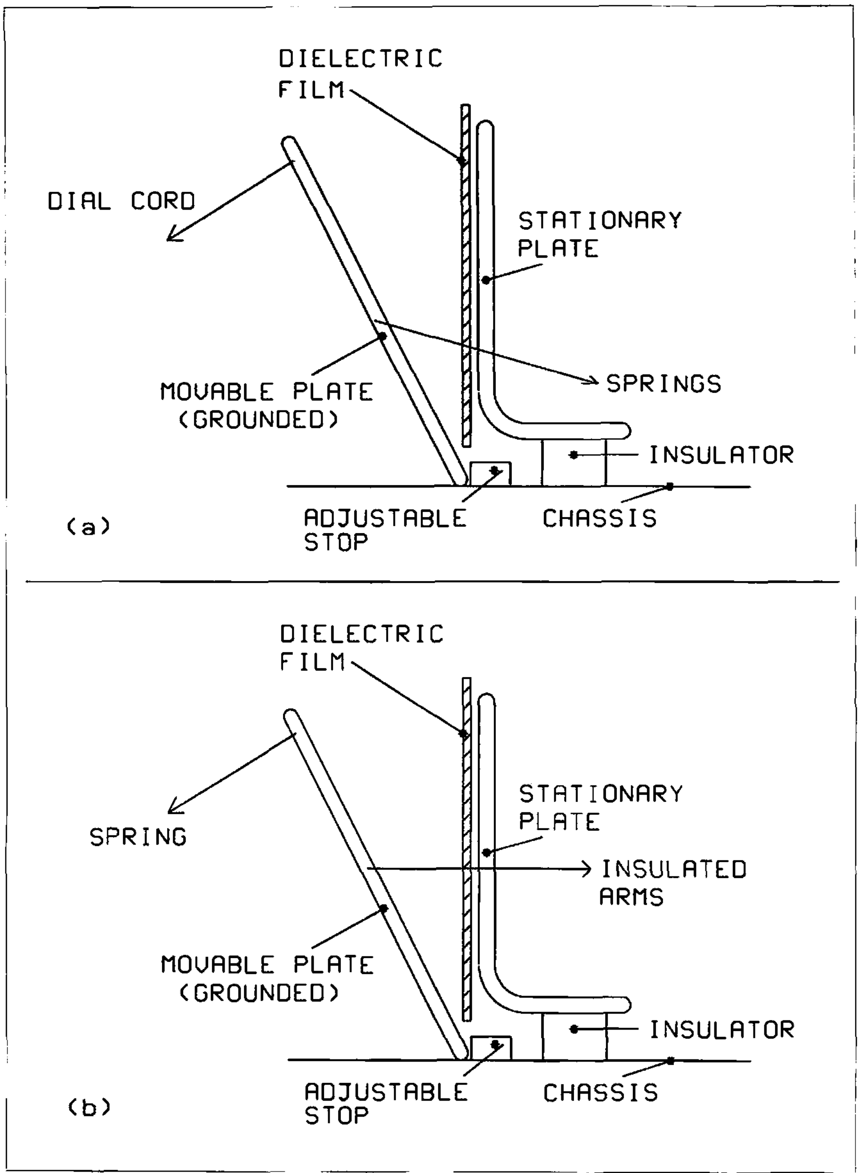

Fig. 3. Arrows indicate the direction in which force is applied to the movable plates of C9 and C12. The adjustable stop is simply a small block of aluminum with an oversized hole (or undersized bolt) that can be positioned as needed and tightened in place. Tension from the springs and linkage hold the movable plates in a 90° corner formed by the chassis and stops. The short horizontal section of the stationary plate is actually two three-quarter-inch-wide "ears" because a "U"-shaped section is cut from the plates before bending them in a vise. This makes bending them easier. Be careful not to deform the plates. With both plates closed, the area contacting the dielectric at C9 measures four by four and one-quarter inches. The area for C12 is four by five inches. I have added a thin (0.010-inch) brass sheet between the grounded plate and dielectric sheet of C12. It is slightly bowed, which provides a less abrupt change of capacitance as the grounded plate moves.

Parts List

D1–D4	400 PIV, 1 A units or equivalent bridge
D5–D8	50 PIV, 1 A units or equivalent bridge
D9	RS #276-044
D10	any 20 mA LED
D11–D16, D20	1N4002
D17	RS #276-012 or Mouser #351-5101
D18	1N4007
D19	1N5819 Schottky
I1, I2	NE-48 neon lamps
K1	10 A DPDT RS #275-218
K2	SPDT relay RS #275-241
K3	reed relay, RS #275-233 or Mouser #431-1412
L1	0.28 μH
L2	0.37 μH
L3	0.5 μH
L4	0.7 μH
L5	1.15 μH
L6	4.5 μH
L7	loaded w/ferrite rod
L8	15 μH
L9	1.4 μH 1/4" copper tubing, 1.7" ID coil, 6 turns over 2 inches
L10	20.4 μH, 23 turns of #12 wire on 2.7" diameter form, 6 turns per inch
Q1	TIP106 or similar
R1	60 Ω, 30 W or higher
R8	10 carbon comp or non-inductive 2000 Ω resistors, 2 W each, in parallel
R14	1/4 W carbon film resistor used as fuse
T1	14 bifilar turns of #26 plastic-insulated hookup wire wound on FT50B-61 toroid, Amidon Inc.
V1	8791 (see text)

Note: L1–L6 to resonate with the combined grid and socket capacitance.

Table 1. Parts list.

through the panel where a knob is attached for the "LOAD TUNE" control. The dielectric film is two-mil-thick polyethylene film, a fancy description of a piece of sandwich, garbage or recycling bag.

The other variable capacitor, C9, uses the dial cord and spring arrangement in **Fig. 3b**. Its Fiberglas™ arms and linkage are above V1. The ends of the Fiberglas arms are joined by a metal bar fastened to a threaded nut. It is attached to another 1/4-20 bolt turned by the "PLATE TUNE" knob. The dielectric film for this capacitor is two layers of 0.010-inch (10-mil) Teflon™. I purchased the Teflon sheet from Regal Plastics, 9342 West Reno, Oklahoma City OK, phone 1-800-444-7755.

The Teflon sheet in C9 is rigid enough to stand in place if its bottom edge rests on the chassis. The small sheet of polyethylene film in C12 is draped over the top of the stationary plate and secured to the back side of the plate with cellophane tape.

I'm using three-quarter-inch-long threaded ceramic standoff insulators to support the stationary plate of C9. Circuit board material is sandwiched between the stationary plate of C12 and the chassis. The three layers are drilled for nylon screws and nuts.

All surfaces near or in contact with the dielectric film of these variable capacitors should be smooth and polished. Instead of square and sharp, the edges of the plates should be rounded. Holes drilled for attachments should also be countersunk, smoothed and polished. This is easy to do by using several grades of sandpaper or emery cloth. Start out with a coarser grade for rounding and smoothing. Wipe off any grit residue from the coarser grade and repeat the operation with a finer grade.

After progressing through a sequence of perhaps 100-, 220-, 350-, to 600-grit, finish with metal polish. Be careful not to scratch the plates when installing them. Smooth, round surfaces are important at C9 because sharp corners and protrusions result in a concentration of the electric fields that may cause arc-over or insulation breakdown. The elimination of mechanically piercing or weakening the thin dielectric film at C12 is also a good reason for having smooth surfaces there.

I used one-eighth-inch-thick aluminum to make all four plates. Anything thinner may warp and not maintain a flat surface while you are working with it or when under tension from the control linkages. A Fiberglas stop between the front panel and stationary plate of C9 adds additional support when the movable plate is pulled against the Teflon sheets.

Setup

Before trying to operate an amplifier such as this, you should make sure the input and output circuits are set up correctly. You can do so without powering up the amplifier. Align the input coils by measuring reflected power seen by the exciter. Either energize K2 or jumper past its normally-open contacts. The dip in reflected power is very broad and should reach a low value.

To find the correct places to tap L9 and L10 in the output network, temporarily install a resistor between the tube anode and ground. This can be a single 1/4 W or 1/2 W resistor if you have some low-power method of measuring reflected power. If all you have is a regular SWR meter that requires a few watts of RF, you may have to cobble together some combination of resistors rated at one or two watts each. Don't use wire-wound power resistors. They have too much inductance.

For this amplifier, the temporary resistor should be approximately equal to the plate load resistance. For example, an amplifier operating class AB1 with a plate current of 500 mA will have a plate load of

$$R = \frac{\text{plate voltage}}{(1.5 * \text{plate current})}$$

or 3600 ohms. The units used here are amperes, volts and ohms.

Remember to leave the plate and screen supplies off and disconnected. To test the output tuning, you will be sending a signal from an exciter or other generator to the amplifier output circuit. This time, connect your SWR meter (or other instrument) to the output connector and energize K1. Alter-

natively, you can connect the SWR meter directly to C12. Again, you are looking for a low reflected-power reading.

Output tuning capacitors C9 and C12 should be adjusted to the value which produces the network-loaded Q needed for the frequency under test. When you find the position on the coil that results in the lowest SWR, that's where you tap it for the appropriate switch position—a lot safer than trying to find the correct tap with the high voltage on.

I used this procedure on my amplifier and it works well. Just don't forget to remove the temporary resistor when you apply plate voltage. If you don't have a method of measuring C9 and C12, it's probably better to err on the side of setting their capacity too high than too low. This can cause a loss in efficiency but it will result in lower levels of harmonic emissions. A loaded Q of 14 with a plate load of 3600 ohms results in the following values in picofarads. These values include tube and stray circuit capacitance.

1.8 MHz: $C7 + C9 = 344, C11 + C12 = 2330$
3.5 MHz: $C7 + C9 = 177, C12 = 1198$
7.0 MHz: $C9 = 88, C12 = 599$
10.1 MHz: $C9 = 61, C12 = 415$
18.068 MHz: $C9 = 34, C12 = 232$
21.0 MHz: $C9 = 29, C12 = 200$
24.89 MHz: $C9 = 25, C12 = 169$

A Q of 16 for 10 meters results in

28.0 MHz: $C9 = 25, C12 = 182$

It's probably a good idea to make these pi-network adjustments with the plate end of RF choke L7 disconnected. Try to arrange the disconnected lead so that it's resting very near its connected position. When you reconnect it after each adjustment, the reflected power reading should not change too much.

If the meter suddenly shows a big mismatch, the L7-L8 combination probably has a series self-resonance on or near the band you're testing. High-power operation in this condition will likely cause poor performance or destruction of the RF choke. Tune L8 by removing or adding turns to move the self-resonant frequency away from any of the desired amateur bands.

Use and operation

The only evidence of instability that I have detected in this amplifier has been a tendency toward a fuse-blowing low-frequency oscillation until I installed C16. It was not installed when **Photo B** was taken. You can use a larger value than 1 μF if necessary. After installing C16, I've experienced months of reliable operation.

Be sure to install covers over any areas with hazardous voltages. I've seen some home-brew amplifiers that work well, but they need safer enclosures and connectors. Connectors for the plate and screen supply cables are inside my power-supply enclosure and hard-wired at the amplifier chassis.

Increasing the output power of my station often allows me to use my operating time more efficiently. Operating on the lower bands often means contending with atmospheric noise when vying for the attention of another station. Single sideband signals seem to suffer from the effects of noise more than other modes such as CW and data modes that concentrate their power into a narrower frequency spectrum.

I'm pleased to find that this amplifier operates reliably, especially considering the unusual nature of output network capacitors C9 and C12. It is possible to break down the insulation of C12 by driving the amplifier hard into a large load mismatch. However, it is also very easy to repair it. Be aware that a slight detuning effect may occur as the capacitors heat and cool during operation. Most of this could probably be eliminated by using better placement, ventilation or nonconductive baffles to redirect the hot exhaust air.

Having extra power is nice, but remember to use it wisely. If you don't need the extra power to overcome path loss, noise or QRM, turn down the "wick." I hear too many operators trying to punch through QRM and annoying everyone (including themselves) when they could easily reduce power and move to nearby vacant frequencies.

Building an inexpensive well-made amplifier is a worthwhile experience. However, when it comes to being a considerate, competent operator, don't scrimp. Be a big spender and invest your best efforts.

Many thanks to Henry Just (K5SAM) and other generous amateurs whose former parts and materials are now part of this amplifier.

3 Ls 4 2m

This three-element stubfed coaxial vertical is dirt cheap, sturdy, and very effective.

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I had an extended J-pole antenna up at my home in the hills of Arkansas. Built of half-inch copper tubing, it worked well, but was easily bent when the wind whipped up. I needed something sturdier, but it had to be cheap and easy to build.

I can't claim invention of this antenna. Similar ones can be found in handbooks dating back over half a century. I did use a unique feed that eliminates insulators and provides a DC ground. This *might* help with lightning. It certainly reduces static buildup and its consequent noise. I also used a coaxial balun and a short length of twinlead to drive the stub. There is probably no particular advantage to this other than making it easy to drive the stub and mechanically easy to tap to the stub.

My entire antenna is made up from one-and-one-quarter-inch-OD galvanized fencetop rail. I cut and welded mine, but that is merely because I had the tools to do so. The instructions here are for PVC pipe. You might bolt yours together.

The center section is made up of a 39-inch length of one-and-one-quarter-inch pipe, wrapped with a 38-inch length of common aluminum available at the hardware store. It is sold by the foot and normally used for roof flashing. A six-inch-wide piece is just right. For those of you who might be worried about the high resistance across the overlap, the antenna currents are parallel to this, so it is of little consequence.

You might have noticed that the dimensions (**Fig. 1**) are short for two-meter use. That is because of the "fatness" of the "wire." Some shortening was necessary to bring everything into resonance. The quarter-wave stub seems especially short. Bear in mind that this stub is quite wide at six-inch spacing. Make sure that you have resonance before fixing it permanently into place. Tack weld it for tuning. The horizontal bar just below this is merely for reinforcement and makes a dandy place to connect your guy ropes.

Since putting this thing on the air, I have had great success with it. I've worked mobiles 30 miles away while running a half watt with my hand-held HTX-202 from Radio Shack™, and was full quieting. I can hear things better than ever, and a great many stations I never heard before.

Some caveats are in order. Lacking sophisticated measuring devices, I cannot be quite sure that the dimensions are the best that they can be. This thing works so well for me, though, that I'm entirely satisfied. Rain, which plagued my J-pole, doesn't affect this one. I'm waiting for the snow and ice. Also, since the wire is fat and there are three collinear elements, the tuning is quite broad. This might not suit some people, but I love it—and my scanner loves it, too.

Before sliding the half-wave center section in place, you should give the upright a good coating or two of clear acrylic to keep it from corroding (if you use metal like I did). A high resistance here will ruin performance. Two sheet metal screws, one just below and one just above the PVC, hold it in place.

When construction is completed, make sure to seal up the gaps (I used a mile of tape) and give *everything* a nice coat of clear acrylic. This not only staves off rust and seals everything, but also locks the tape in place.

Guying is a good idea if you expect any wind. I guyed my antenna with half-inch parachute cord, but that is up to you. If your antenna is mounted on a tower with very little mast extension, you might be all right. Just remember that this tubing isn't all that strong.

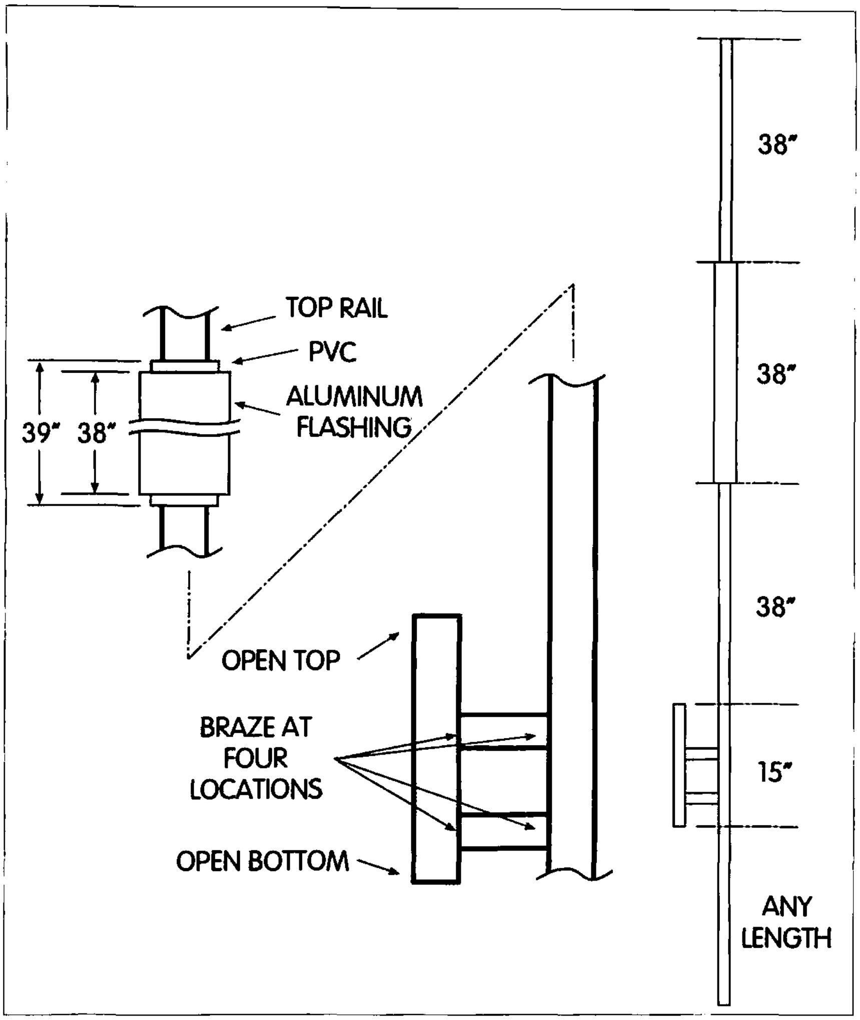

Fig. 1. Overall dimensions and construction details of the coaxial vertical.

And if it is galvanized steel, someday it is bound to rust. The clear acrylic mentioned above should protect it for many years, though.

Referring to the figures for details of the feed system should make everything clear without further explanation.

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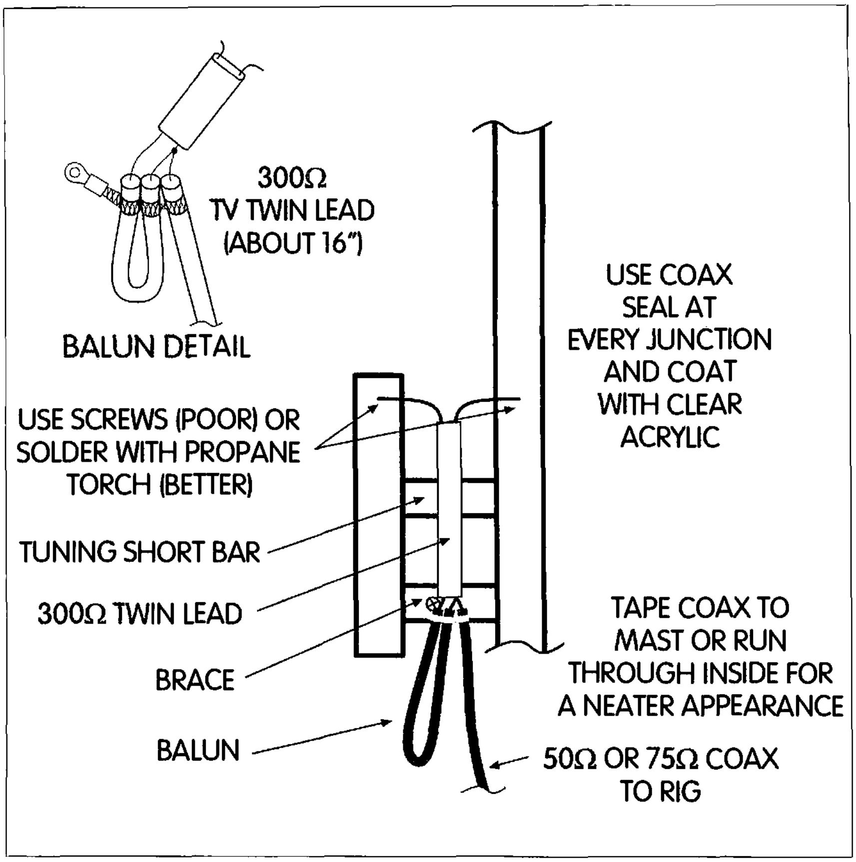

Fig. 2. Balun construction and mounting details. All three shields from the balun are attached to a ring terminal and then attached to the mast brace with appropriate hardware.

3 Ls 4 2m

continued from page 20

To make a coaxial balun, if you've never done this before, it is simply a matter of figuring the velocity factor of your coax and cutting off a half-wave-length of it. Form it into a horseshoe shape. Connect the shields of each end to the shield of your feedline coax. Connect the center of the feedline coax to one of the horseshoe's centers. That is one feedpoint, and the remaining center is the other one. Using 50-ohm coax gives a feedpoint resistance of 200 ohms. Connect a 200-ohm resistor and check it for a 1:1 VSWR. Adjust the horseshoe's length until it is 1:1 or very close. Simple, huh?

For five bucks and a little work and some coax, I have an antenna that is sturdy, good looking (no stubs sticking out of the sides for birds to perch on), *and* it works better than the commercially-made antenna that I once had. Good luck with yours!

The Evolution of Power Supplies

Part 2: Switching techniques.

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Part 1 of this pair of articles covered the development of dynamotor and vibrator power supplies as they applied to automobile radios. Hams took advantage of power supplies available from both military and commercial sources and used them for powering their equipment in mobile applications. During the development period for the dynamotor and vibrator supply, conventional AC wall-powered power supply design remained fairly constant, except for the changes required in the transition from vacuum tubes to semiconductors, with voltage regulation becoming the most obvious advancement.

Here in Part 2 we will cover later power supply designs utilizing switching techniques that enabled the use of simple and reasonably efficient power conversion equipment in many applications, including spacecraft. Power supplies used in the home PC are of a switching type that exhibits both reasonably high reliability and high efficiency. When they fail, a ham is usually available to catch the pieces, but what does he do with them?

Some failed switching supplies are repairable if sufficient information is available for use as a troubleshooting guide. Hopefully the following discussion will help you learn more about switching supplies, and perhaps even enable the repair of a few, too.

DC-DC converter

A DC-DC converter is designed along the lines of a vibrator power supply, and in fact is really just a solid state version of it. The primary differences between the vibrator and DC-DC converter are the operating frequency, efficiency, and performance reliability. DC-DC converters can be operated at almost any switching frequency of interest, with many operating in the 30 kHz region. At that frequency, the amount of iron required in the transformer core is reduced considerably, allowing the power transformer to be miniaturized without a loss in output power availability. The power conversion efficiency of DC-DC converters has approached 90%.

For a period of time, DC-AC inverters (switchers) were developed to produce 120 VAC from a 12 VDC power source. Many inverter kits were made available to the ham so that low-power 120 V vacuum tube equipment could be powered in automobile applications. Because of this application, inverters were designed to output 120 VAC at 60 hertz, but, unfortunately, early inverter designs were load-dependent, causing them to shift frequency with load variances. In addition, the output waveform was anything but a sine wave, so that switcher noise was evident in receivers operating in the vicinity of an inverter. Although most inverters were well filtered, it was never really enough.

In operation, one or two transistors may be used to provide the switching, as shown in **Figs. 1** and **2**. **Fig. 1** uses a single transistor and a transformer operating in an Armstrong oscillator configuration which is suitable for producing a voltage at almost any magnitude but low power. Excessive loading on the single-ended oscillator can cause it to stall. **Fig. 2** shows two transistors operating in a push-pull Armstrong oscillator, making it capable of producing a reasonably high power output. Output is taken from the emitters through winding "P" (primary) and the feedback to drive the bases is obtained from winding "T" (tickler).

Two switching techniques have been used in DC switchers: transistor saturation and core saturation. It doesn't matter which switching technique is

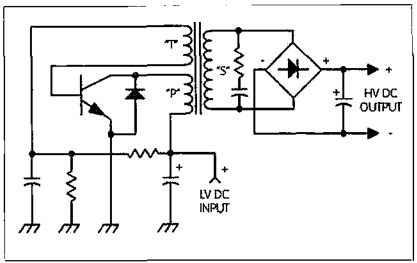

Fig. 1. Single transistor switching power supply.

used, but it is essential that current must increase rapidly through the primary winding to a point where saturation occurs, and that's the switch point for starting the next cycle. For the circuit shown in **Fig. 2** to operate properly, the transistors must saturate in order to obtain a low series emitter-collector resistance value. The low saturation resistance reduces the transistor heat dissipation, particularly in high power supplies.

Upon reaching the next switch point, the second transistor begins to conduct, driving the alternate transistor into cutoff until the following switch point is achieved. The circuit operates just like an electronic teeter-totter that has a hard stop at the end of each travel.

When first developed, DC-DC converters (switchers) were used to power vacuum tube circuits in which a high voltage was required for tube operation. Hams used switching supplies for mobile applications until solid state radios became available. However, DC-DC converters continue to fly in many of the older spacecraft and are used for power conversion in some solid state equipment today to power gas panel displays and particularly where a negative voltage must be developed.

Even the high power audio amplifiers (boomers) used in automobiles require supply voltages well above 12 volts and that voltage is provided by a DC-DC converter. The reliability of a solid state converter parallels that of the old dynamotor in many respects, but with an efficiency exceeding that of a vibrator supply.

Power switchers

With the advent of home computers, power supplies evolved even further. If you can remember when huge power transformers were used in electronic equipment, you'll recall that the weight became almost unbearable when the equipment needed to be moved. Of course, the evolution in TV set power supplies eliminated the power transformer, with technology advancements influencing the switcher design as used in modern home computers.

Computer power supplies still use a power transformer, but it is small in comparison to the huge 60 Hz power transformer size that would be required to handle an equivalent amount of power, which is typically in the region of 230 watts.

Switching power supplies for computers were developed around several techniques, but the typical design uses an IC oscillator with pulsewidth modulation for voltage regulation and load control. With the low cost of switcher supplies, it really isn't cost effective to repair them, but it is fun to try. Therefore, here are a few highlights about how a switching supply operates. Hopefully, the insight might enable you to try to repair a failed supply or two.

The first step in examining a switcher supply is to look at two of the common methods for driving the output power transformer. **Fig. 3** shows two transistors, *not* complementary, but of the same type, driving the transformer primary through a capacitor. Separate out-of-phase square wave signals drive the transistor bases, causing a square wave current flow through the primary winding of the transformer. The high voltage provided to the circuit is in the range of plus and minus 120 VDC at about one ampere of current in order to achieve 230 watts of output power. **Fig. 4** utilizes a slightly different design approach using complementary transistors, but the power transfer is the same as in **Fig 3.**

A block diagram of a typical switching power supply is shown in **Fig. 5**, where the major circuit components are identified. The circuit designs of other available switching supplies vary considerably, but the concept of operation is similar and **Fig. 5** will aid in understanding and repairing them.

Because switching supplies are pulse (square wave) operated, they must be loaded at all times to prevent high voltage transients from breaking down components. The +5 V output is the recommended circuit to be loaded prior to the application of 120 VAC to the input. Most switching supplies will fail to start if the load is missing or is too light. Load sensing in **Fig. 5** is sampled at both the -5 and -12 volt outputs, while other supply designs may choose to sample elsewhere. Any output can be used for no-load sensing, because voltage spikes due to a no-load condition will appear equally in the other outputs from the transformer.

Switching power supplies operate in a closed loop, which requires that every circuit must respond as designed or

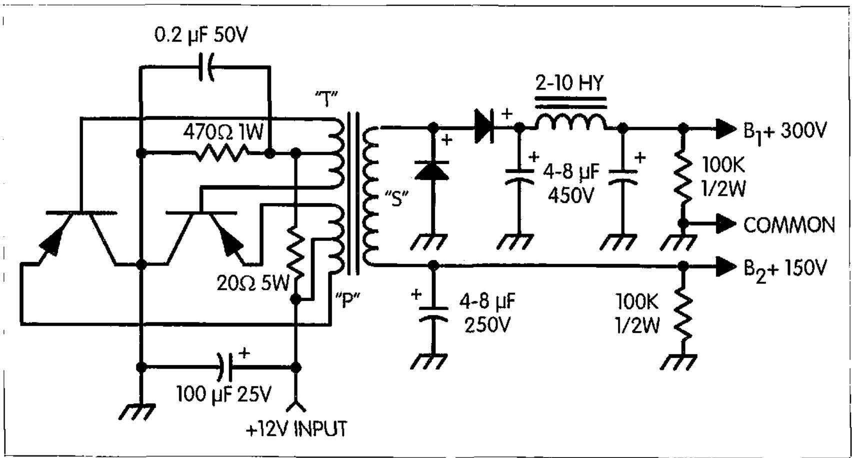

Fig. 2. Transistor DC-DC switcher. Rectifiers configured to provide two levels of output voltage.

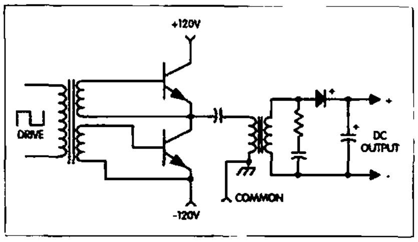

Fig. 3. Same type transistor switch driver.

the oscillator/PWM (pulsewidth modulator) will not allow the switching action to begin. Troubleshooting a failed switching supply becomes difficult because of the closed loop design concept. Using the teeter-totter again, the board must be whole, or it will fail to rock back and forth.

Circuit operation begins with power applied to the output driver circuit. *No DC voltage is applied directly* to the supply's output circuit or PWM. However, the initial application of AC power causes the output of T1 to pulse which is sufficient for the PWM to "start." Starting is done by IC1, which must oscillate to provide a square wave drive signal for transistors Q3-4, which are the excitation drivers that provide the drive to transformer T2. The output of T2 provides the drive signal to output transistors Q1-2. Once transistor Q1 and Q2 begin driving T1, power becomes available at each of the DC output terminals. A failure in any one of the loop elements will cause the power supply to malfunction.

Once the power supply is up and operating, voltage regulation is controlled by IC1 by changing the pulsewidth of the drive signal to transistors Q3 and Q4. The width of the supplied pulse is relative to the amount of required load power measured as terminal voltage at the -5 and -12 V outputs.

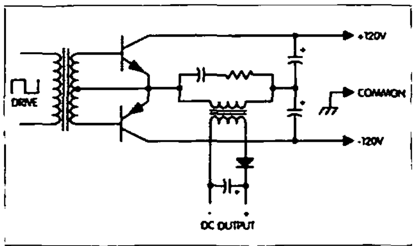

Fig. 4. Complementary transistor switch driver.

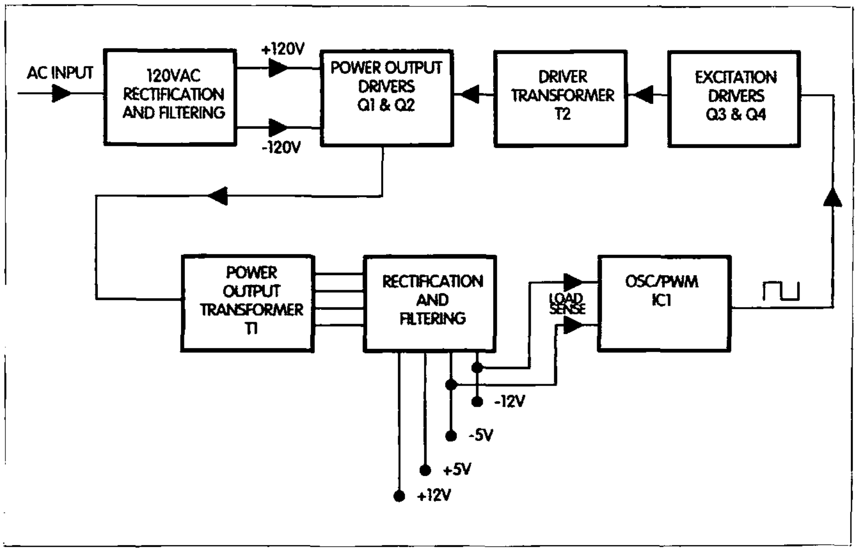

Fig. 5. Typical 230-watt switching power supply. Voltage regulation performed by pulsewidth modulation.

Because switching power supplies designed for computer applications require a fixed load, they are unsuitable for use with ham radio equipment where the load can vary. Of course, there are exceptions to every rule and hams will find the exception. For hams, the caution is that a suitable load (perhaps on the order of 50% of the rated amount) must remain on the supply at all times, and due to the switching nature of the circuit, an abundance of RF noise is generated and can cause RFI problems in receivers.

Conclusions

Power supplies powered from the AC mains and from automobile batteries have evolved over the years. Yet simple 120 VAC transformer-operated supplies are still very common, with their changes being primarily in the regulator circuitry. But the older automobile power supplies have evolved considerably from the dynamotor and vibrator configurations to DC-DC switching converters in applications in which a voltage is required that is greater than the battery voltage or of an opposite polarity.

The transition from vacuum tube technology to solid state technology was the primary driver for the elimination of power supplies in automotive applications. Perhaps the greatest changes in AC power supplies have been those associated with use in TV sets and computers, where the large, bulky power transformers have essentially been eliminated. Switching supplies have provided a high reliability and have retained a fairly high efficiency in the power conversion process. 73

From the Ukraine: A Radio Amateur's Story

Behind the Iron Curtain, home-brewing was the mother of invention.

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During World War II. soldiers from both the East and West fought against a common foe. Our soldiers and yours shed their blood to free the world from Hitler's tyranny. But then came the Cold War years, which kept our countries apart. For far too many years our respective armed forces gazed with apprehension across the borders between East and West. And at the citizen level, all we knew about one another was what our politicians told us. I would like to share with you my story of how I grew up in the Ukraine during those years, and became a radio amateur and engineer.

As you read this account, keep in mind that World War II left the Ukraine devastated. Technical literature and electronics parts were difficult—and in many cases, impossible—to obtain. And we youngsters of the Ukraine had to improvise. It was a period not unlike America's Great Depression years.

The beginning

I grew up in the Ukraine during the late 1950s. Mine was a poor working family. My parents rented a small room in an old private house. My father, a World War II veteran, worked both a day and a night job to make enough money to build a home for our family. My mother also worked to provide food for our family of four, which at that time included me and my little sister, eight years younger.

After completing my lessons, I would spend almost all of my time in the school library. I read almost everything there, and in a short time I was allowed to walk among the shelves and select whatever I wanted. I once found back issues of a small magazine with strange letters on the cover. Instead of a name, it had only "YT" printed on the cover. It caught my attention, and in a short time I found that the letters stood for "Young Technician." The magazine contained a lot of interesting articles for boys.

I must reminisce for a moment. My father worked as an aircraft technician serviceman, and he would talk about technical things and share stories about his work. My young mind was full of his stories. Instead of a carpet on the earthen floor of our room, my mother placed a piece of trimming plate from an old airplane wing from my father's work. I remember that green square with the nice red star in the center.

Meanwhile, those magazines impressed me so much that I read all of the back issues that were available in the library. It opened a new world of knowledge for me. Then I discovered one small book. It was the manual for the Young Technician's Group. My school did not have such a group, but I checked this book out also. It was full of practical descriptions of a variety of technical experiments and tests. And I was not able to understand most of them.

I began with the first and simplest experiment. The article claimed that if someone would take an iron nail and wind several dozen windings of copper wire around it, it would perform an unusual function. The article claimed that it would act like a magnet if you connected the ends of the coiled wire to a lantern battery. I was sure that they were joking, but I decided to hook it

up and find out for myself. But first I had to find the parts. The nail was not a problem, and I located some wire. The battery in my father's pocket lantern was also available.

After I finished building the project, I could hardly believe what happened. Old razor blades, as well as needles from my mother's sewing set, jumped to the end of the nail when I switched on the battery, and then dropped back to the table when I disconnected the wires. It was fantastic! I was very impressed and excited, but I paid for my experience with a dead lantern battery!

The next time I checked the book out, I was eager to find out what else I could do. One of the more complicated projects was a crystal detector radio. A curious thing about this broadcast receiver was that it did not need any supply voltage. This was strange indeed! At that time, my family did not have a radio, and to make such a useful item would certainly increase my prestige with my family and friends, not to mention older people as well.

The instructions recommended using a half-liter glass bottle as a support for making a coil form fashioned from several layers of paper. The layers of paper were glued together, and once the glue had set, the bottle was supposed to be removed. But I applied too much glue on the paper, and the coil form was securely glued to the bottle. I would have to use them together. This only made the project all the more intriguing.

I wound the coil using copper wire I found at the airfield. The coil was now ready, and one of my friends promised to give me the capacitor. But the main problem was to find a crystal detector. There was a drawing of the detector in the book, and I could visualize it in my mind. The detector was a rather serious-looking device. It had two solid metal legs mounted onto a piece of insulating material. It looked like a plug for AC power. On one leg was a metal lever with a handle. A spring was attached to the other end of the lever. The spring was made from a small piece of guitar string. A small stone of detecting crystal was fastened to the top of the second leg. To make such a device, you had to be clever and have steady hands.

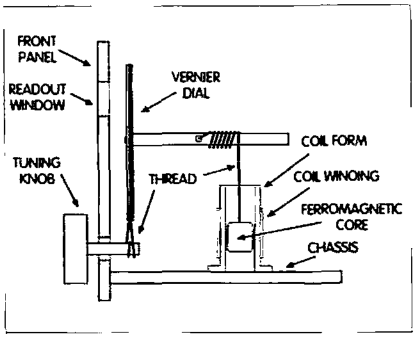

Fig. 1. "Pail-well" variable inductor.

But still the major problem was to obtain the crystal itself. The book described how to make the crystal by boiling materials in a test tube. I no longer remember the whole recipe, but I seem to recall that among the ingredients were sulfur and lead. In any case, the ingredients were to be heated until the mixture melted. After allowing this mixture to cool, the glass tube was to be broken to release the small gray stone. This stone must then be mechanically mounted to the leg under the steel spring. The end of the steel spring was very sharp and must be pressed onto the crystal stone and moved about until the active point for receiving the station was found.

Unfortunately, producing the crystal stone itself was not the greatest problem I faced. I simply was unable to produce the legs and their plastic insulator. This part of the project was doomed to failure. I attempted to remedy this by trying to buy the device at a radio parts store. This was my last hope. The salesman at the store couldn't understand what I was trying to describe. Instead of the detector illustrated in the book, the salesman offered me a small glass tube with a metal band at each end. He told me that it was a germanium diode and it could be used in my radio. But it wasn't what I needed. It was not like the picture in the book. Tears formed in my eyes and ran down my cheeks, and I sadly walked out of the store. The project was dead.

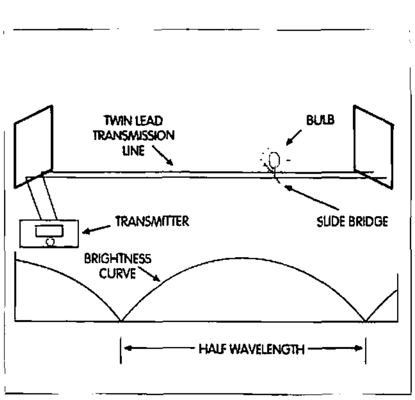

Fig. 2. Shorting load bridge.

Sounds at last!

The early '60s marked the beginning of the era of semiconductors in the Ukraine—especially transistors. Broadcast receivers employing transistors soon became available. I remember that the first one was named "Mir," which means "peace." These first radios were extremely expensive. And pocket transistor radios were not yet common. We schoolboys were in a frenzy to build our own transistor radios. Between classes we would swap schematics, ideas, and even parts.

I made several attempts to find good schematics and appropriate parts. It was my dream that my radio would at least make a weak sound. I was just a boy and there was no one to help me. I tried every schematic I could find in the library—but no success. I just couldn't understand what was wrong, and I continued to work more and more. At last I found a schematic which seemed to be better than the previous ones. It was a middle wave receiver. The receiver type was known as a 2-V-3, meaning it was 2 RF stages, an amplitude detector and three audio stages. It was very difficult to find all of the appropriate parts. For a prototype board, I used a cardboard cover from an old book. After soldering almost everything together, there was one part missing. It was a loudspeaker. It was impossible to find a small speaker in the shops or stores. It was the beginning of the transistor's epoch, and we had a shortage of everything. I would have to build my own loudspeaker.

I knew that a loudspeaker needed a coil and a magnetic core inside. It also needed a paper cone, and a case, holding the cone and membrane. Before I could make drawings, I needed to find the main parts. I thought about this for a while, and decided that there were two main parts: the magnet and the case. For the case, the easiest solution was to swap or borrow a small metal plate from my little sister's set of toy dishes. She was five years old and she played with her toy dishes in the sand. I selected one of her plates. It was two inches in diameter—this would be my speaker's case. To find a good magnet, I went to the TV repair parts store and found a magnet used for raster correction.

After preparing a drawing, I asked my father for help. He was always willing to help me. At that time, my father was a worker in one of the large factories. No one knew what they produced there. But with my drawings, he stayed after work to prepare my parts. With a large grinding machine, he made a very accurate cylinder from the magnet I bought. Another round detail was turned on a lathe.

To make the cone, I used some blotting paper that we used to remove ink from our notebook pages in school. One half of a razor blade, with a needle soldered to its center, produced the membrane. The sound coil was also wound. Everything was then assembled and glued together. With trembling hands, I soldered the ends of the sound coil wires to the receiver output. Then I switched on the battery power with great anticipation. I heard a weak noise like a trapped fly trying to escape.

With my heart pounding, I began turning the variable inductor—suddenly I heard a metallic voice delivering the midnight news. Sounds at last! I was so happy. I had finally built a working receiver! Two weeks later, I rebuilt my radio into a plastic box (soap dishes were very good for the purpose at that time). My receiver became not only a toy for me, but also for older people. My father was very proud because this radio was made by his son.

My first QSO

A couple of years later, while reading books, I learned how to prepare myself to become a ham radio operator. And I was very excited when I found unknown voices near the 41 meters shortwave

broadcasting band. They were hams operating phone on the 7 MHz band. That was the era of amplitude modulation, and it was easy to find them on an ordinary home receiver.

After several weeks of listening (without any SWL callsign, of course), I decided to search the library books for appropriate receiver schematics, especially for radio amateur use. I selected a three-tube superheterodyne: one tube as mixer/oscillator, a second as IF amplifier, and a third as an AM detector and single-stage audio amplifier. It was a four-band receiver covering the 3.5, 7, 14, and 28 MHz bands.

All my spare time after studying my lessons was spent with this project. I found two IF transformers in an old military receiver. They were 1600 kHz ones and they would work just fine. The main problem was the lack of a variable capacitor. I improvised by fashioning a "pail-well" device (**Fig. 1**). It consisted of a tuning knob with a smaller shaft to provide vernier tuning, and a four-inch-diameter disk. The shaft with the knob was connected to the disk by silk thread. Into the center of the disk, a longer shaft was tightly pressed. A piece of thread was wound around the longer shaft. From the end of this thread, a small piece of round ferromagnetic rod was suspended (it came from an old, broken American military receiver).

When I rotated the tuning knob, the ferromagnetic core would move into or out of the cylindrical coil form of the heterodyne coil. This adjusted the frequency down or up and allowed me to tune to the desired station.

After several weeks, and many adjustments, finally the receiver began to receive amateurs. I was so happy to hear them. At the beginning of 1965, after a very long wait, I got my first license and the callsign UB5EFP. It was for the simplest class at that time. It allowed me to operate phone on 10 meters and up. Morse code was not required.

I started by building a transmitter for 29 MHz. It was a three-stage rig using a 6L6GT as the final amplifier. Old-timers will remember this tube. In the USSR the tube had another name, but it was the same tube.

When the transmitter was almost ready, I understood I needed the microphone. Unluckily, there were no possibilities of buying a new one. Microphones mostly were supplied with tape recorders. But I never had this very expensive toy and it was a task to make the microphone, too.

A solution was found at the nearest factory rubbish heap. I found there a used carbon microphone cartridge from a telephone handset. To use it for my home needs, I had to add a small transformer, a battery, and a switch. Electrically, all was connected in series. I mounted those parts into the plastic box and added feet.

This rather big construction was placed on the table in front of me. Its audio sensitivity was so high that I could hear all the countryside's sounds coming through the window. There were barking dogs as well as crowing cocks.

I was very disappointed after finishing my transmitter. I could hear myself in the headphones, but no one answered my calls. Even local operators ignored my calls. What did this mean? I finally understood that something was wrong with this transmitter, and I was unable to correct the problem.

I had an interesting idea about checking the transmitter frequency. To make this experiment, I missed one day of school. My parents went to their work, but I stayed home. I opened the door to the next room and hammered two nails into the windowsill. I repeated this process with the distant opposite window in the other room. The nails in the window sills were spaced four inches apart. By connecting wires to the nail and stretching the wires between the rooms, I fashioned a twinlead open-wire transmission line. One end of the transmission line I connected to the transmitter output, and the other end was left open. I made a shorting load bridge of hard copper wire with a small bulb in its center (**Fig. 2**).

With the transmitter on, I walked alongside the transmission line between the rooms while moving the bulb load

Continued on page 33

Here Comes the Sun

Part 1: Cycle 23 and you.

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Solar cycle 23 is growing fast, and the high-frequency ham bands are once again hopping with activity. After several years of listening to the mind-numbing hiss of a dead band, DX is back ... and hams are tuning their dials ever higher in frequency as 20, 15, and even 10 meters once more produce contacts from around the world.

Good news for DX

Cycle 23 began quietly in the fall of 1997. Growing slowly at first, solar activity began to increase a few months later. By early spring of 1998, the many active spots on the sun were producing major flares, and some researchers were predicting that cycle 23 may peak higher than cycle 19, the highest peak ever recorded. If this prediction bears out, we will certainly see transoceanic contacts on six meters, and perhaps even higher.

Solar activity has historically been measured by counting sunspots. This data is averaged and recorded as the Smoothed Sunspot Number, or "SSN." The SSN for a given date is derived from data recorded for six months before and six months after the target date. This is a rather cumbersome system, but it's still used so that the data will conform to that collected since 1755, the first year for which complete data was recorded. On this scale, cycle 19 peaked in 1958 with an SSN of 201. By comparison, cycle 22 peaked at 158.

Just what is a "solar cycle"?

The planet Earth has a magnetic field. This field is a stable dipole: There is a north and a south pole, and they correspond (within a few degrees) to the rotation axis of the planet. The lines of magnetic flux travel through the center of the planet from one pole to the other, then return above the surface, flowing in the shape of a flattened sphere.

The sun also has a magnetic field, and most of the time it, too, is a dipole. However, every 11 years or so, this field does something strange: The magnetic poles start to move. Over a period of many months, the sun's magnetic field rotates 90° and becomes *toroidal*.

There is no external magnetic field at this point. The magnetic flux actually travels around the sun's equator, so there is no "north" or "south." There are, however, tremendous circulating currents *inside* the sun, and it is these currents that produce the intense electrical and magnetic disturbances we see as sunspots, flares, and coronal mass ejections.

Eventually, the magnetic field continues on, past the equator, and finally ends up a full 180° from its starting point. The field again becomes a stable dipole, although what was once the north pole is now the *south* pole, and vice versa. The solar activity quiets down, and the sun's magnetic field remains stable until the next cycle begins. The exact time can vary, from as short as seven to as long as 17 years, for an average of 10.7 years between cycles.

What does this have to do with ham radio?

As solar activity increases, so does the solar output. Sunspots may appear darker than the surrounding solar surface in visible light, but they are brilliant in the X-ray spectrum. Ultraviolet (UV) and extreme ultraviolet (EUV) output also increases dramatically from the surrounding area. This solar

radiation increases the ionization of Earth's upper atmosphere (called, appropriately enough, the *ionosphere*) and this, in turn, changes the way radio waves propagate around the globe.

The ionosphere is separated into distinct layers, each having a different effect on radio waves. The closest to Earth is the D layer, extending from 45 to 55 miles. This area is essentially an "RF sponge." As solar radiation increases, so does the radio absorption. This absorption is *inversely* proportional to frequency, which means that as solar radiation increases, we must use higher frequencies to penetrate the D layer.

At times of extreme solar activity, the D layer may become so charged that *all* radio frequencies below VHF are absorbed. Fortunately, the D layer needs direct solar radiation to maintain ionization, so as soon as night falls, the lower frequencies become usable again.

The E layer extends from 65 to 75 miles, and the F layer starts at around 90 miles and reaches to 250 miles or more. In daylight, the F layer separates into two parts, called F1 and F2. These layers have the ability to *bend* radio waves traveling through them. This bending effect is inversely proportional to frequency, so at some point the wave doesn't bend enough to return to the surface, but continues on into space. As solar activity increases, this bending effect also increases, allowing higher frequencies to be returned to the surface.

Like the D layer, the E and F1 layers need direct solar radiation to maintain ionization, and quickly disappear after sunset. The F2 layer, however, maintains its charge long into the night, and once the RF-absorbing D layer disappears, even low-powered signals can be returned to Earth thousands of miles away. During times of peak solar activity the F2 layer can return signals as high as 50 MHz.

The effect of this ability to bend high-frequency radio waves late into the night when absorption is low can be amazing. Cycle 21 peaked with an SSN of 164.5, and at that time you could literally "work the world" with only a few watts. In fact, at the peak of cycle 21, I chatted with an Australian ham for several hours on 15 meters using no more than a Ten-Tec Argonaut and a wire loop. Since the signals were pinning the S-meters both ways, I started backing down the power. From the original five watts, I reduced the drive until I could no longer see any power indication on the meter—and the other fellow never noticed!

Electrons and protons

X-rays and ultraviolet are not the only solar output with an effect on propagation. During times of intense activity, the sun also produces electrons and high-speed protons. These can interact with Earth's magnetic field to produce some interesting effects on radio communications.

Electrons from the sun become trapped in Earth's magnetic field, where they tend to "clump" on either side of the equator. When this cloud of captive electrons becomes dense enough, it will reflect radio waves between the northern and the southern hemisphere in a single long hop. This is called *transequatorial* propagation.

Protons, on the other hand, generally *disrupt* high-frequency communications. Streams of high-energy protons radiate from solar flares and, like electrons, they become trapped in Earth's magnetic field. These energetic particles spiral down along the magnetic lines of flux, entering the atmosphere at the poles. When they reach the D layer, they cause a dramatic increase in ionization and hence absorption of radio signals. The effect is most pronounced at the poles, but very large flares can disrupt communications over the entire planet, sometimes for days.

And now, the bad news ...

Hard radiation and high-energy particles from major solar flares can do far more than alter radio propagation. They can be deadly to sensitive electronics, especially when the electronic devices are located in orbit, high above the shielding atmosphere. With so many people depending on that technology today, losing our network of

satellites is unthinkable ... and yet that is exactly what could happen if cycle 23 continues to grow. The last major solar cycle was in 1958, before any of this technology existed. Today we have communications satellites, weather satellites, the Global Positioning Network, and hundreds of military satellites critical to national security. All of this technology is vulnerable, and most of it has no backup.

Satellites are not the only technology at risk. If the solar flare is really large, the high-speed protons can carry enough energy to actually penetrate the magnetic field and the atmosphere and reach the surface. This happened in 1992, and again in 1997. While the exposure is certainly much less on Earth than in space, keep in mind that satellite technology uses radiation-hardened electronics, while Earth-based technology does not. Protons with enough energy to reach the surface can be harmful to living things as well.

Magnetic effects

So far, we've only discussed solar radiation: X-rays, ultraviolet, electrons, and protons. There is another solar phenomenon that occurs as solar activity grows ... the coronal mass ejection, or CME.

As the solar magnetic field rotates into the toroidal phase, tremendous circulating currents grow inside the sun. These currents in turn cause enormous loops of magnetic flux to reach out from the surface, extending far out into space before arching back to the sun. We can see these loops because hot, electrically charged plasma is trapped by the magnetic flux, creating an awesome visual effect. When these loops collapse, enough energy is released to vaporize a small planet.

These magnetic loops do not always collapse. Instead, a loop will occasionally break free and fly off into space, becoming essentially a huge, toroidal magnetic "cloud," carrying with it millions of tons of solar matter, mostly protons and electrons. This is a coronal mass ejection.

Since CMEs can spin off in any direction, and Earth is a relatively small target, most of them miss us entirely. Now and then, however, scientists will note a CME breaking free of the sun that looks like a perfect ring. This "halo CME" is very likely headed straight for Earth. CMEs travel much more slowly than the solar radiation, so while we may see the X-rays and UV radiation from an eruption within minutes, it will generally take several days for the magnetic effects to reach us.

When Earth is hit by a CME, it's generally no big deal. In fact, most people never notice. The CME reaches Earth's magnetic field, and Earth's field is compressed, and this in turn causes it to intensify. This effect is fairly large far out at the fringes of the magnetic field, but at the surface it's only detectable with a sensitive magnetometer.

Another effect of the interaction of Earth's magnetic field with the CME is to make the magnetic poles wobble slightly. During a CME-induced magnetic storm, it's not uncommon to see a compass swing back and forth a few degrees. On rare occasions this effect can be quite large—variations of 10° to 15° are sometimes observed.

As every ham knows, when you move a conductor through a magnetic field, you generate electricity. The same thing applies when you move the field through the conductor. It's therefore obvious that when Earth's magnetic field changes intensity and wobbles back and forth, current will flow in every electrical conductor on Earth. Most metal objects are too small to generate any appreciable voltage, but long conductors such as power lines, telephone wires, and even railroad tracks can develop a surprising amount of electricity. All transmission lines today have surge suppressors at regular intervals, but a large CME can occasionally overload them. The result can be power blackouts and interrupted telephone service over large areas.

The big one?

As solar activity increases, flares and CMEs get larger, more intense, and more frequent. What if we were to catch a *really* big CME?

As we mentioned earlier, Earth's magnetic field is a stable dipole, at least for the moment. Geologists tell us, however, that the Earth's field has reversed itself on occasion. In fact, around *two hundred* such reversals are known to have happened in the past 50 million years or so.

If a *really* large CME were to hit, Earth's field would be compressed and would increase in strength. If the field intensity were pushed beyond a critical flux density called the Alfven-Lawson Plasma Current Limit (17KA/cm^2), the magnetic vectors would rotate 90° and collapse into a *toroidal* field—*exactly* as we see happen every 11 years on the sun. Look at the intense violence that occurs on the surface of the sun when the magnetic vector flips. Try to imagine that happening *here*.

But as bad as this sounds, there's an even bigger problem. A toroidal field is self-shielding, so while this pole-reversal is taking place, Earth would have *no external magnetic field!* At a time of peak solar activity there would be no magnetic field to protect us from the intense solar radiation. As one of NASA's solar scientists remarked when I ran this scenario past him, "That's a lot of sunblock!"

How big will cycle 23 get?

While it's impossible to predict with any certainty just how a solar cycle will develop, we can make a guess based on several factors. For one thing, we know that solar activity has been steadily increasing for as long as we've been keeping records. It's highly likely that there are cycles much longer than the 11-year pole reversal cycle, and we just have not been around long enough to measure them.

Another factor is the even-odd relationship. At least since cycle 10, all odd-numbered solar cycles have peaked from 1.2 to 1.6 times higher than the even-numbered ones. It's not clear why this happens, but it could relate to the internal circulating currents flowing either with or against the direction of solar rotation. Cycle 22 peaked at 158, so if the pattern holds true, we could see cycle 23 peak anywhere from 190 to 253.

There could be other factors to consider, too. While it's not known what actually causes the 11-year solar cycle, one of the best theories is gravitational stress. As the planets revolve around the sun, they cause a tidal effect. A small bulge moves across the solar surface in line with a planet. When two or more planets happen to line up, this effect is multiplied. This, by the way, is called "syzygy."

The planets that have the greatest tidal effect on the sun are Jupiter, Earth, and Venus. Mercury, despite its small size, also has some effect, due to its proximity to the sun. If you look at the planets over time, you will find that these alignments do tend to correspond to the times of solar maximum.

If this theory turns out to be accurate, we may be in for a wild ride indeed. As pointed out by researcher and author

Say you saw it in *73!*

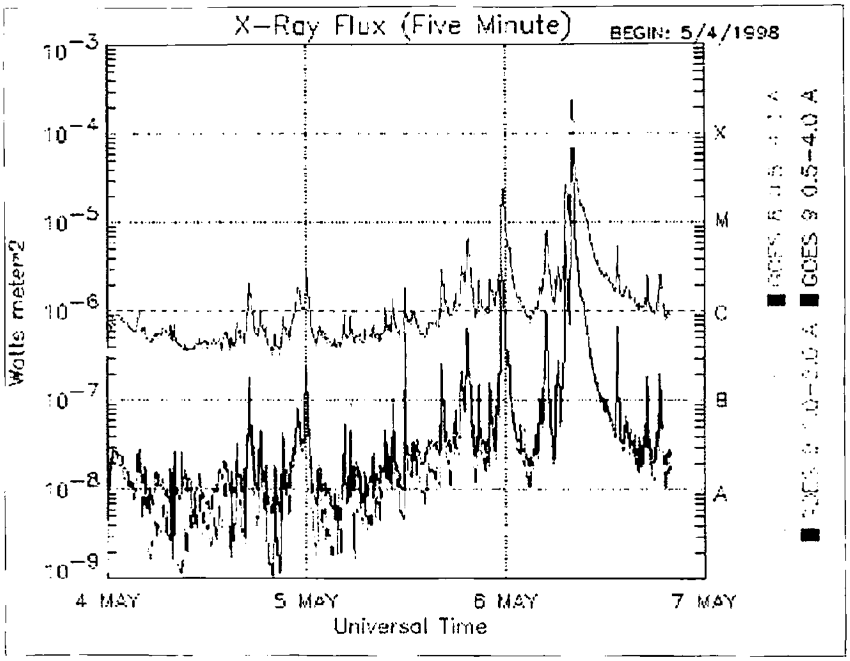

Fig. 1. This graph shows the X-ray flux measured by the GOES *satellites on May 6, 1998. The sharp peak is the X-class flare, the largest of a two-week series of huge flares. This information is from the NOAA Space Environment Center Web site.*

Richard W. Noone in his book 5/5/2000, there will be a nearly perfect alignment of *all* the planets *and* Earth's moon on May 5th, 2000. Noone is concerned with the gravitational effects on the polar ice caps, and the possibility of it triggering a slipping of Earth's crust. He seems to have missed the possibility of a solar effect from this alignment. By the way, the scientists from NOAA's Space Environment Center predict that cycle 23 will peak in March of the year 2000, with a window of uncertainty from June 1999 to January 2001.

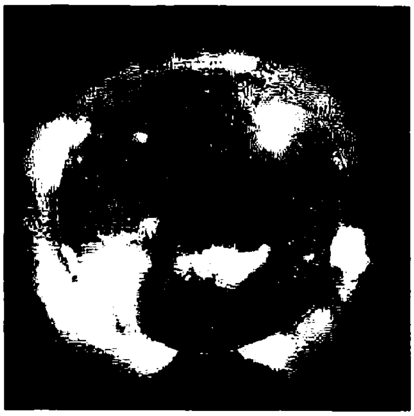

Photo A. *This image of the sun was taken with NASA's* SOHO *satellite on May 6th, the day of a huge X-class flare.*

Keep tabs on cycle 23

We have many more tools available to us today than ever before, and these are providing us with a never-before-seen look at the sun as cycle 23 grows. Thanks to the Internet, you and I have access to the data as it comes in. The Space Environment Center, a part of NOAA, posts real-time graphs showing the X-ray, electron, and proton flux, as well as geomagnetic data. This information comes from the *GOES 8* and *GOES 9* weather satellites. You can find this data (and much more) on the SEC's Web site. The URL is [http://www.sec.noaa.gov/].

Another source of solar information *was* the *SOHO* spacecraft while it was still transmitting data. The most fascinating part of the *SOHO* data was the images: full-disk high-resolution photographs in many different wavelengths showing incredible detail. You can go to [http://maj.com/sun/] to see these full-color images on the Web.

A good Internet source for current solar information as well as historical data for past solar cycles is the Solar Terrestrial Report. Go to [http://dxlc.com/solar/] and bookmark this one.

If you're in an apocalyptic mood, you might want to read more about CMEs and the danger that they pose to life on Earth. The expert in this field is Charles Cagle, and his Web site [http://www.teleport.com/~singtech/] contains technical information on this and many other interesting topics.

Information on the geomagnetic field and its interaction with the sun can be found at [http://geomag.usgs.gov/], courtesy of the US Geological Survey.

Of course, the National Bureau of Standards station WWV still broadcasts solar data and propagation warnings. The 10.7 centimeter solar flux is reported at 18 minutes past the hour.

Who ya gonna call?

Although it's certainly possible, it's highly unlikely that cycle 23 will be large enough to cause Earth's magnetic poles to flip. Other damage, especially to communications and the power grid, is much more likely, but not a certainty by any means. Still, while you sit there in front of your rig searching for those strange-sounding calls and peculiar accents, take a minute to remember that the same sun that is now bringing those signals to your antenna could also cause some very serious problems. As our civilization depends on ever-more-complex technology, it also becomes more fragile. We have not only put all our eggs in one basket ... we've also wired those eggs in series.

Amateur radio exists to serve the public in the event of such a situation. Every ham should have a disaster plan, and every ham should consider things like emergency power, backup equipment, and spare antennas. (While you're at it, don't forget food and water!) This is part of our "job description" as hams, and the reason we have a billion dollars' worth of frequency spectrum with which to play.

One last thought

On April 20, 1998, an intense disturbance on the sun started to produce major flares. During the last week of April and the first week of May, this

area produced huge "M class" and monstrous "X class" flares almost daily. A large CME was observed heading for Earth, but several days later a second CME erupted. The second CME was so energetic that it overtook the first, and *both* arrived together. The X-ray flux finally returned to normal as this active area rotated around to the far side of the sun.

Only a few days later, the *Galaxy 4* communications satellite totally failed after several weeks of problems. People all over the country suddenly discovered that their pocket pagers didn't work, and their credit cards wouldn't validate. TV stations lost their satellite feeds without warning. Happy DXing!

Next time: Geomagnetic monitoring. 73

From The Ukraine: A Radio Amateur's Story

continued from page 27

across the lines. I was fascinated by the bulb's changing brightness at different points along the line. I measured the distance between the points with minimum brightness. These points were the half wavelength of my transmitter's frequency. I now understood the problem. My frequency was far outside the band! In a couple of hours the transmitter was readjusted and the problem was fixed.

I waited until the local television station shut down for the night, because 10-meter AM transmitters produced very strong interference. I waited until a local operator finished with his QSO. I then took the mike and with trembling voice called him. I could hardly believe my ears ... he answered me! He answered my call, he really heard my signals! I was so happy. I remember that date. It was a rainy fall evening, October 12, 1965.

Thanks

I would like to express my sincere gratitude to David Evison W7DE for giving me the inspiration to sit down and write this article, and for his patient reading and preliminary editing of it.

About the author

Vlad Skrypnik was licensed in 1965 with the callsign UB5EFP. In 1967, he upgraded his operating class and received a new callsign, UY5DJ. He is an active operator on HF, both CW and SSB. For outstanding results achieved in USSR contests, he was awarded a "Master of Sport" degree in 1975.

As an amateur radio constructor, Vlad has long been interested in designing amateur radio equipment and measuring devices. Since his start in 1972, his projects have been in all possible kinds of exhibitions of amateur radio design. For his achievements as a designer of some of his country's best construction projects, Vlad was issued a "Master Radioconstructor" degree in 1984.

In 1989, Vlad was awarded the rank of "Honored Radioist" by the Ministry of Communications of the USSR for his contributions to the development of amateur radio.

Vlad saw his first published article in *Radio* magazine in 1974. He has subsequently had published dozens of articles on technical projects for radio amateurs. In 1990 and 1993, two of his books were published. The first, which sold 200,000 copies almost immediately, described test and adjustment devices for ham radio. The second was about programming in BASIC and includes many useful amateur radio programs.

Vlad continues to work as an engineer in radio and electronics. 73

73's DX Dynasty Award

This is the current list of DXDA award winners. The DX Dynasty Award is the most enjoyable DX award around. Any correspondence concerning DXDA should be addressed to DXDA, c/o 73 Magazine, 70 Route 202 N, Peterborough NH 03458 USA.

**BASIC AWARD—
100 COUNTRIES
WORKED**

1. W1RFW
2. WB2DIN
3. KT1A
4. W3FDU
5. KA9JOL
6. WB1BVQ
7. NW7O
8. AK4H
9. W3HCW
10. KZ2W
11. K9FD
12. WD5N
13. KA9TNZ
14. K9GBN
15. N5GAP
16. WB3FMA
17. NN6E
18. AL7HG
19. N6CGB
20. K16AN
21. K9JPI
22. N4WF
23. K6PKO
24. KW7J
25. VE6JO
26. WA4IUV
27. W4ZFE
28. N4KMY
29. WØHBH
30. K8KJN
31. KG1V
32. K1KOB
33. KY3F
34. PY2JY
35. YB5BEE
36. YB5BEH
37. WB9SBO
38. NØAFW
39. KA9MOM
40. N3II
41. W6DPD
42. KE8GG
43. VE6VK
44. KD9RD
45. W4WJJ
46. KØHSC
47. K16GI
48. IK1APP
49. KJ4RR
50. K8MDU
51. N1EIU
52. K1DRN
53. WD8REC
54. ZL2BLC
55. VE3EFX
56. W9MCJ
57. N6IV
58. KN8D
59. KC5YQ
60. WB6ITM
61. KA2AOT
62. K4LHH
63. VE2QO
64. KE5AT
65. W9SU
66. W3OOU
67. NR2E
68. KF5PE
69. N3FBN
70. KB4SJD
71. N3EZX
72. IK8GCS
73. WB4I
74. NG1S
75. WB7UUE
76. HK4EB
77. KØBFR
78. N7GMT (KF7SH)
79. AA4VN
80. KA1LMR
81. N8AXA
82. NM2I
83. KD9YB
84. HC2CG
85. VE1BXI
86. YC2OK
87. N4GNL
88. GM3UBF
89. 5Z4BP
90. IØAOF
91. VE1BN
92. KA2NRR
93. 5Z4DU
94. KB8ZM
95. HK4CCW
96. W2JQ
97. HC2AGT
98. WD5N/M
99. VE1BHR
100. VE1AGZ
101. K5AOB
102. KW2D
103. PY3ARZ
104. WB4ETD
105. N2FPB
106. KD3CQ
107. K4NNK
108. VU2DNR
109. AA5BE
110. PY3OG
111. VE4ACF
112. VE4SI
113. PJ2KI
114. WB4CKY
115. W6EQB
116. KK4IY
117. IK1IYU
118. N6GCN
119. KB1AF
120. KB8BHE
121. KE2CG
122. VS6CT
123. G3IZQ/W
124. WB6FNI
125. KAØIAR
126. K9SM
127. W6BCQ
128. KA5MSL
129. WB4FLB
130. N7GLT
131. WAØX
132. KF4GW
133. N4QGH
134. VE1CBK
135. 7J1AAL
136. K6ICS
137. NZ7W
138. WBØN
139. WC7F
140. F6IFE
141. KL7N
142. KE8LM
143. WA6YOO
144. VE2MFD
145. N3APQ
146. HK1DBO
147. NM3V
148. IK6GFY
149. WB6UAN/M
150. NK6Z
151. KB6IUA
152. W9OKH
153. WB5FXT
154. NB3E
155. N2ESP
156. YU2EJU
157. OZ1DXX
158. IK5IIU
159. KA1ION
160. KD3AI
161. OK1AEH
162. W9LCR
163. 8P6SH
164. KA6SPQ
165. ZF2KH
166. W6MVV
167. JA8CAQ
168. K16WF
169. K2MRB
170. AA6GM
171. JAØSU
172. NU8Z
173. GØGRK
174. YB8VM
175. DV1BRM
176. WØTU
177. N7CNH
178. PY3IO
179. YBØZCA
180. YBØAF
181. VE3PQB
182. W2SV
183. N1ADE
184. WP4AFA
185. KS7V
186. W2OFB
187. G4ASL
188. N5JUW
189. KA8WAS
190. 5NØWRE
191. AA4IP
192. JR5KDR
193. KD2WQ
194. KA3NIL
195. WA8YWK
196. VE1ACK
197. HP2XVB
198. WB5KYK
199. N5JUJ
200. N4OBJ
201. 9Q5NW
202. KW2D
203. VE1HA
204. HP8BSZ
205. IK8JJQ
206. YC3DKN
207. I3VKW
208. K2EWA
209. KD3CR
210. N9GDG
211. KF8K
212. FD1BEG
213. DU1DZA
214. N8IMZ
215. KK4YA
216. LU1JDL
217. KA8YYZ
218. KA4TMJ
219. WA9DDC
220. YI1CIS
221. YC3FNL
222. GØFWG
223. KV4B
224. N5IET
225. WA9WIG
226. N3CDA
227. KE6KT
228. IK7DBB
229. JY5EC
230. N1ETT
231. PY2DBU
232. I8IYW
233. NØISL
234. KC4BEB
235. WA7QQI
236. KA1RJG
237. OZ9BX
238. KB4HBH
239. KA3RWP
240. NJ1T
241. W4DCG
242. YCØRX
243. VE7OJ
244. AA4W
245. N9GMM
246. KB4HBH
247. KM4HF
248. CE1YI
249. KA1FVY
250. N2GVB
251. N2DAO
252. WF8E
253. YBØHZL
254. N5MBD
255. N4SNS
256. KA3TGY
257. JN3XLY
258. N4DUV
259. KA9MRU
260. KA4OTB
261. N4JED
262. AB4KA
263. WA7OET
264. KA3RVH
265. CE7ZK
266. NI9J
267. WB9PTN
268. KB8DAE
269. WØCL
270. WB7VUB
271. JF6TUU
272. ZY3IO
273. KB4VIR
274. OE6CLD
275. N7JJQ/DU3
276. KK4FB
277. DU1AUJ
278. K2EWB
279. NI5D
280. N2JXC
281. NØIWT
282. WB3BDH
283. K1CVF
284. KA3CXG
285. KA1SPO
286. WA4NWT
287. KJ4OI
288. KA3UNQ
289. WB2VMV
290. KD4MM
291. OE3DHS
292. KD9HT
293. DL8OBC
294. G3KVA
295. WA4NEL
296. KA4VZO
297. NØIDT
298. KA1FUE
299. KD7EO
300. JH8MWW
301. KB8ICD
302. JA1CKE
303. N3GEE
304. JA5MG
305. KA1FTU
306. WA8KMK
307. N2IBW
308. N4THE
309. N3CYD
310. JA4TF
311. W6YLL
312. WA1S
313. KC5WA
314. N6WK
315. PY4OY
316. KG7BO
317. WB3FQY
318. WCØA
319. VE4AMU
320. YCØMCA
321. WA3LEU
322. KB2GLO
323. OZ1FNX
324. K6GCF
325. KC4PCX
326. KA7EXD
327. DK9EA
328. HL5AP
329. SM7BRO
330. ON6DP
331. WA3KKO
332. KB9ABI
333. DA2UI
334. SMØBNK
335. WA2BMQ
336. WAØQIT
337. 5Z4BH
338. KB9ALG
339. OA4ANR
340. OD5ZZ
341. VE3ZD
342. LU2ATR
343. HL5FRG
344. UB5LRS
345. N1ICC
346. UY5XE
347. PS7AB
348. IK4NPC
349. KD1CT
350. DU1CHD
351. UB4WZA
352. LU3CF
353. G7AZP
354. VE5AAD
355. IK3ITX
356. SM4SEF
357. N9CPK
358. VE2JWK
359. N7JXS
360. KO4VO
361. JE1GWO
362. JM2DRM
363. IK1SLE
364. JF7QUE
365. HL5BUV
366. VE3GLX
367. N7QXQ
368. JE6KLR

369. KK6JY
370. N2BI
371. KK4XL
372. JA3SSB
373. KBØADI
374. 11-50156
375. VU2SMN
376. EA6AAK
377. N3IHS
378. N8MOT
379. KB2NEK
380. PY2DBU
381. WA2CKP
382. WB2PPN
383. JA1-2Ø762/BV
384. AB4ZD
385. YC8EMH
386. WA8RLB
387. N5VWM
388. VE7SKB
389. KB4BCC
390. VE7GSE
391. YC8BWN
392. KN6ER
393. KD1CJ
394. G2BFO
395. KB7ROK
396. VK2EQ
397. 4X4-2175
398. JE1BGL
399. KF2LC
400. WV2X
401. LU5EWO
402. WAØCLR
403. VO1UL
404. VE6AML
405. WD4REX
406. WAØCLR
407. VE3VJC
408. WA1MKS
409. JH6FHJ
410. JE9EMA
411. WK8X
412. TI2YLL
413. KP4WN
414. KD6MOS
415. KI7CM
416. JH1IED
417. JN6MIC
418. BU7FC
419. DL1EMO
420. KD4TWP
421. 5W1GC
422. JA7JI
423. W5RUK
424. LU3OJZ
425. WD4OHD
426. 7L1MFS
427. ON4BCM
428. WØUHL
429. N4WJV
430. LU5DSE
431. HS1NGR
432. DU1SAN
433. 4X/G3WQU
434. K3BSA
435. CP8AK
436. K8IHQ
437. JA7NUZ
438. HL5FXP
439. N9PM
440. K9UQN
441. WA7SNY
442. HL5YAW
443. DS5WQT

150 COUNTRIES ENDORSEMENT

1. WB2DIN
2. N4WF
3. N6GCB
4. K9FD
5. NØAFW
6. N3II
7. WB1BVQ
8. KA2AOT
9. KI6GI
10. N7GMT
11. IK8GCS
12. IK1APP
13. VE6JO
14. VE4ACF
15. WB4I
16. IK1IYU
17. KE2CG
18. G3IZQ/W1
19. WB6FNI
20. K8MDU
21. VE6VK
22. KB6IUA
23. WB5FXT
24. YU2EJU
25. IK5IIU
26. KE8LM
27. KA1ION
28. KA6SPQ
29. W6MVV
30. JA8CAQ
31. KI6WF
32. JAØSU
33. WD5N
34. W2SV
35. W6BCQ
36. F6IFE
37. VE2MFD
38. WP4AFA
39. 5NØWRE
40. KD2WQ
41. VE1ACK
42. N5JUJ
43. 9Q5NW
44. KB8BHE
45. I3VKW
46. KD3CR
47. N8IMZ
48. GØFWG
49. N2FPB
50. KE6KT
51. OZ9BX
52. NJ1T
53. CE1YI
54. YBØHZL
55. JN3XLY
56. KA9MRU
57. CE7ZK
58. KB8DAE
59. K2EWB
60. NI5D
61. KD3CQ
62. KA4OTB
63. WB2VMV
64. KD4MM
65. KD9HT
66. KA3NIL
67. NØIDT
68. KA1TFU
69. KA4TMJ
70. JA4TF
71. KA3UNQ
72. KB8ZM
73. K2EWA
74. WA1S
75. PY4OY
76. WCØA
77. OZ1FNX
78. KA7EXD
79. ON6DP
80. VE1RJ
90. N6WK
91. WA3KKO
92. KB9ABI
93. SMØBNK
94. WAØQIT
95. 5Z4BH
96. OA4ANR
97. OD5ZZ
98. VE3ZD
99. HL5FRG
100. UB5LRS
101. PS7AB
102. KD1CT
103. DU1CHD
105. IK3ITX
106. VE2JWK
107. N7JXS
108. JM2PRM
109. HL5BUV
110. VE3GLX
111. KK6JY
112. EA6AAK
113. N3IHS
114. WA2CKP
115. VE6AML
116. WAØCLR
117. WA1MKS
118. KD6MOS
119. KP4WN
120. LU5EWO
121. 5W1GC
122. JA7JI
123. W5RUK
124. LU3OJZ
125. ON4BCM
126. WØUHL
127. N4WJV
128. LU5DSE
129. VO1UL
130. DU1SAN
131. 4X/G3WQU
132. K8IHQ
133. K9UQN
134. WA7SNY
135. HL5YAW

200 COUNTRIES ENDORSEMENT

1. N3II
2. WB2DIN
3. K9FD
4. IK8GCS
5. NØAFW
6. WB1BVQ
7. VE4ACF
8. KI6GI
9. N6GCB
10. K8MDU
11. YU2EJU
12. KE8LM
13. WD5N
14. F6IFE
15. 5NØWRE
16. KE2CG
17. I3VKW
18. CE1YI
19. W6BCQ
20. CE7ZK
21. KB8DAE
22. K2EWB
23. KD3CQ
24. KD4MM
25. KD9HT
26. KA4TMJ
27. N7GMT
28. JA4TF
29. K2EWA
30. WA1S
31. PY4OY
32. ON6DP
33. VE1RJ
34. WA3KKO
35. WAØQIT
36. 5Z4BH
37. HL5FRG
38. JA1-2Ø762/BV
39. VE6AML
40. LU5EWO
41. 5W1GC
42. JA7JI
43. W5RUK
44. LU3OJZ
45. WØUHL
46. N4WJV
47. VO1UL
48. DU1SAN
49. K8IHQ
50. K9UQN

250 COUNTRIES ENDORSEMENT

1. WB2DIN
2. IK8GCS
3. WD5N
4. K8MDU
5. KE2CG
6. CE1YI
7. CE7ZK
8. K2EWB
9. KD9HT
10. N7GMT
11. KD3CQ
12. KB8DAE
13. WA1S
14. PY4OY
15. VE1RJ
16. 5Z4BH
17. N2BI
18. 175OI56
19. VE6AML
20. KB8ZM
21. LU5EWO
22. JA7JI
23. W5RUK
24. WØUHL
25. K9UQN

300 COUNTRIES ENDORSEMENT

1. WB2DIN
2. IK8GCS
3. K2EWB
4. K8MDU
5. N7GMT
6. WA1S
7. PY4OY
8. KD3CQ
9. VE1RJ
10. UY5XE
11. IK3ITX
12. VU2SMN
13. JA7JI
14. W5RUK
15. LU5EWO

350 COUNTRIES ENDORSEMENT

1. WB2DIN
2. PY4OY
3. UB4WZA
4. JA7JI
5. KD3CQ

If you're a No-Code Tech, and you're having fun operating, tell us about it! Other No-Code Techs will enjoy reading about your adventures in ham radio—and we'll pay you for your articles. Yes, lots of nice clear photos, please. Call Joyce Sawtelle at 800-274-7373 to get a copy of "How to Write for 73 Magazine."

1998 ANNUAL INDEX

Ham to Ham	Lightning protection, Part 6	NZ9E	JUN 52
Ham to Ham	Lightning protection, Part 7	NZ9E	JUL 54
Ham to Ham	Lightning protection, Part 8	NZ9E	AUG 54
Ham to Ham	Lightning protection, Part 9	NZ9E	SEP 42
Homing In	Italian Connection (Guglielmo Marconi)	KØOV	SEP 51
How About A Kinky-Interesting-Sexy-Sexy?	A trip down phonetics lane	GØJOE	APR 66
How Safe Is Your Mobile?	Assuming you want to know...	W6YBT	MAY 46
Marsha and Me	Making friends via hamming	WF6P	JAN 64
No—Honestlyl I'm Not a Piratel	British Novice	2E1DPG	JAN 70
On the Go	OOPS!—over...	KE8YN/4	JUL 62
On the Go	We provide services, save the bands	KE8YN/4	AUG 60
On the Go	Satellite disruptions and Y2K	KE8YN/4	SEP 53
Out of Sight, Out of Mind	Getting along with the neighbors	WB4BNU	MAR 80
Probing Auto Electronics	Hams can be good neighbors	W6WTU	DEC 10
Publish or Perish	Club newsletters (Reprint)	N1BLH	JAN 66
Roamin' Romania	Part 1: Timisoara...	WB2AQC	JUN 67
Roamin' Romania	Part 2: Amateurs of the Jiu Valley	WB2AQC	JUL 65
Take the Jekyll and Hyde Test	Which shack is yours?	W2CQM	JUL 34
Techno-Trouble for Know-It-Alls	50 questions	WB2WIK/6	APR 28
Techno-Trouble II	Another 50 questions	WB2WIK/6	JUN 29
The Ideal Log	Computer-style card file	W6BNB	OCT 21
The Perfect Field Day	Did everybody have fun?	N8IDA	OCT 54
The Shelby Hamfest	Shelby's 41st year	KA4J	JUL 64
Tips from a QSL Guru	Here's how to make your card count	W6BNB	JUN 64
Vintage Values	Heading for a hamfest?	W2BLC	JUL 25
Ham Radio Fun Section			
A Krystal Kludge	A book excerpt from The Xtal Society	WØIZC	FEB 65
Adventures in Regulation	How to use a fixed voltage regulator	W6WTU	APR 64
Bridge Over Troubled Watters	Why buy what you can build?	NØBLX	MAR 67
Determining Antenna Feedpoint Impedance	Even you can learn from this tutorial	W6WTU	AUG 64
Don't Leave Home Without It	Ingenious tester for wallet or purse	W2UW	MAR 64
Home-Brewing Italian-Style!	A two-element phased beam for ARDF	IK8VWA	MAY 64
How About A Kinky-Interesting-Sexy-Sexy?	Down phonetics lane	GØJOE	APR 67
In Search of a Simple Capacitor Tester	A midsummer night's dream project	KD6ORG	
Letter from Down East	One ham won't clam up	W3UWH	FEB 64
Marsha and Me	Making friends via hamming	WF6P	JAN 64
No—Honestly! I'm Not a Pirate!	A tale of travail from a British Novice	2E1DPG	JAN 70
Roamin' Romania	Part 1: Timisoara...	WB2AQC	JUN 67
Roamin' Romania	Part 2: Amateurs of the Jiu Valley	WB2AQC	JUL 65
Scrounger's Delight	The Minnesota miser's magmount	NØBLX	FEB 77
The Shelby Hamfest	The weekend before Labor Day	KA4J	JUL 64
Tips from a QSL Guru	How to make your card count	W6BNB	JUN 64
Ya Gotta Shop Around	Do your homework, get the best deal	K5LAD	MAY 66
Mobile			
On the Go	Mobile antennas	KE8YN/5	MAR 58
On the Go	Kenwood TS-130S	KE8YN/4	OCT 43
On the Go	Up, up, and away	KE8YN/4	DEC 47
Truckez-Vous Mon Boat?	Ham friends rescue the *Voyageur*	N4UAU	MAR 10
Modifications			
A Silk Purse...	Upgrades for Heathkit SB-104 Xcvr	K9ARF	AUG 10
Modifying Your Ramsey Xcvr Kit	...the ultimate ham experience	NØBLX	APR 18
Tear Apart Your Tube Supply	Drake AC4 modifications	WB2CQM	FEB 33
Upgrading the 209 (MFJ ant. analyzer)	Add a resistance meter	KG5CM	JAN 15
New Products (by manufacturer)			
Alinco	DJ-S46 HT	Staff	JUN 72
Allison Technology Corp.	O-Scope II oscilloscope module	Staff	JUL 72
AlphaLab, Inc.	Micro Alert alarm	Staff	AUG 72
ARRL	*1998 ARRL Handbook*	Staff	MAR 79
ARRL	*1999 ARRL Handbook*	Staff	NOV 48
ARRL	*Radio Frequency Interference...*	Staff	SEP 48
ARRL	*Radio Amateur's Sat. Handbook*	K2UBC	MAY 72
ARRL	*RF Exposure and You*	Staff	JUL 72
Buckmaster	*Copy this and pass™* audio CDs	Staff	DEC 48
CCTV Corp.	BC-450 and BC-935C Ball Cameras	Staff	APR 72
Comm. Spec.	ANI-1 ID Encoder	Staff	FEB 72
Contact East	1998 General Catalog	Staff	MAY 72
Cushcraft	TechExpress online tech help	Staff	OCT 48
Cutting Edge Enterprises	PowerPort PowerSafe	Staff	APR 72
Cutting Edge Enterprises	PowerPort RF-35	Staff	FEB 72

Environmental Technology, Inc.	RCD-1/ RCD-2 Passive Dehydrators	Staff	JUL 72
Grove Enterprises	SP-200B Sound Enhancer	Staff	JAN 72
Hall Bros. Manufacturing	Decoder Coin	Staff	FEB 72
Hamco	*Hidden Antennas* catalog	Staff	DEC 48
Hammond	T304 exciter, R304 receiver	Staff	SEP 48
Hamtronics	40 page catalog	Staff	APR 72
Intuitive Circuits	DTMF-8 decoder board	Staff	JUL 72
Janus Computer Services	*Little Little Book About Yaesu VX-1R*	McCully	AUG 72
Jensen Tools	Free catalog	Staff	JAN 72
Jensen Tools	HotRod Safety Screwdriver	Staff	MAR 79
Jensen Tools	Crescent® insulated nutdrivers	Staff	AUG 72
Kantronics; Creative Services Software	PacTerm 98 for the Kantronics TNC	Staff	SEP 48
Kenwood	RadCam	Staff	NOV 48
Kenwood	TK-290 and TK-390 transceivers	Staff	OCT 48
Kepro Circuit Systems	Kepro BTE-302 glass bead etcher	Staff	NOV 48
Lakeview Company, Inc.	Tri-Magnetic Mount (Cat. #375)	Staff	NOV 48
Larsen Electronics	YA3220 line of Yagi directional ants.	Staff	AUG 72
LLH Technology Publishing	*Simple, Low-Cost Electronic Projects*	Blechman	OCT 48
MAXRAD	FME Universal Connectors	Staff	JUL 86
MCM Electronics	New catalog	Staff	FEB 72
MFJ	MFJ-118 Jumbo LCD™	Staff	FEB 72
MFJ	MFJ-270 Guardian Angel™	Staff	NOV 48
MFJ	MFJ-292 Featherweight Earphone	Staff	JAN 72
MFJ	MFJ-295Y Mini-SpeakerMic™	Staff	JUL 72
MFJ	MFJ-310 HT window mount clip w/BNC	Staff	JUL 86
MFJ	MFJ-414 Morse Code Tutor	Staff	SEP 48
MFJ	MFJ-641 RapidBattery™ Charger	Staff	APR 72
MFJ	MFJ-1736 Six-meter J-pole ant.	Staff	AUG 72
MFJ	MFJ-1762 3 El 6m Yagi	Staff	DEC 48
MFJ	MFJ-2881; MFJ-288K	Staff	MAY 72
MFJ	MightyLite™ Switching Power Supply	Staff	JUN 72
MFJ Publishing	*Morse Code: Breaking the Barrier*	N1IRZ	MAR 79
Milestone Technologies	ElectroInstrument Key-8 Paddle Keyer	Staff	JUN 72
Milestone Technologies	Tokyo Hi-Mound Morse equipment	Emm	MAY 72
Mirage	B-24-G Docking Booster	Staff	JUN 72
Mirage	B-510-G 2-meter amplifier	Staff	OCT 48
Morse Express	G4ZPY keys and paddles	Staff	DEC 48
Novatech Instruments, Inc.	2950AR/01, /02, /03 Freq. Standard	Staff	JUL 86
Old West Graphics	Banners	Staff	JUN 72
RF Connectors	RFN-1001.5 N Male Universal Plug	Staff	JUL 86
Pelican Products	Alignlite™ zenon beam flashlight	Staff	AUG 72
PhotograFix	*Ham Radio: Simplified*	Cornwell	OCT 48
R.L. Drake Company	R8B	Staff	JAN 72
Sony	ICF-SCIPC Scanner	Staff	MAY 72
Svetlana Electron Devices, Inc.	*1998 Audio Tube Catalog*	Staff	DEC 48
TAB Books	*Home Video*	Yoder	NOV 48
The Radio Works	Catalog 981	Staff	JUL 86
TTE, Inc.	Model 305-1270M-60M 5-Pole Filter	Staff	JAN 72
Universal Radio, Inc.	*Discover DXing!*	Zondlo	MAY 72
Vectronics	More than 30 kits	Staff	OCT 48
Wm. M. Nye Company	Model 330C Key	Staff	OCT 48
Xuron Corporation	LX Series Micro-Shear®	Staff	DEC 48

Packet

The Digital Port	Packet programs and SSTV	KB7NO	JAN 51
The Digital Port	HF modem for $15	KB7NO	FEB 61
The Digital Port	Freebies in ham radio	KB7NO	MAR 59
The Digital Port	Serial modem, soundcard, TNC?	KB7NO	APR 53
The Digital Port	1200b packet modem kit	KB7NO	JUL 52

Power Supplies

Pentium-Style Positive and Negative PS	New technology is great...	N4UAU	JUN 10
The Evolution of Power Supplies	Part 1: Dynamotors and vibrators	W6WTU	NOV 13

QRP

Announcing the QRPeanut	Compact QRP transmatch	N5GZH	DEC 14
Five-Band Magnetic Loop Antenna	Build a loop for QRP	K2KSY/HL9BK	JAN 18
QRP	Heathkit HW-8	WB8VGE	JAN 50
QRP	VFO	WB8VGE	FEB 57
QRP	HW-8 modifications	WB8VGE	MAR 57
QRP	High-current sealed battery charger	WB8VGE	APR 75
QRP	QRP rigs	WB8VGE	MAY 58
QRP	A QRP Field Day	WB8VGE	JUN 63

QRP	The basics	WB8VGE	JUL 58
QRP	New equipment	WB8VGE	AUG 61
QRP	NorCal's 38 special	WB8VGE	SEP 54
QRP	NorCal's 38 special—a closer look	WB8VGE	OCT 44
QRP	Revenge of the oscillator from hell!	WB8VGE	NOV 52

Radio Direction Finding, Fox Hunts

Build the FoxTTL Foxhunt Transmitter	Simple, inexpensive	AH2AR/8	NOV 10
Homing In	Field Day	KØOV	NOV 47
Homing In	Friendship and foxhunting	KØOV	JAN 62
Homing In	Canadian capers	KØOV	FEB 58
Homing In	Build tough fox-boxes	KØOV	MAR 61
Homing In	Build the Montreal Fox Controller	KØOV	APR 77
Homing In	Build an offset attenuator	KØOV	MAY 76
Homing In	ARDF is off and running	KØOV	JUN 75
Homing In	Receiver hunting	KØOV	JUL 60
Homing In	Tracking owls, cranes, and foxes	KØOV	AUG 58
Homing In	Italian Connection (Guglielmo Marconi)	KØOV	SEP 51

Repeaters

On the Go	Steve Nowak	KE8YN/4	APR 58

Reprints

Publish or Perish	Club newsletters	N1BLH	JAN 66

Reviews (by manufacturer)

Advance Design Labs	CodeKey	KB1UM	FEB 68
Alinco	A Real Handful–DJ-C5 transceiver	VE3EGA	DEC 24
C&S Engineering	SatTrack: Automatic Ant. Tracking	KAØSNL	JAN 32
Comm Spec	Model ID-8 Morse Station IDer	K4CHE	MAR 46
Drake TR Series	Some of the best vintage equip.	W2BLC	DEC 52
Embedded Research	Just the TiCK Kit	K4CHE	OCT 33
GMSK Data Products	High-Speed Packet Modem	G3LDI	MAY 40
Hamtronics	CC432-5 Receive Converter Kit	WB9RRT	APR 37
Hamtronics	R301 Synthesized VHF Receiver	WB9RRT	NOV 26
Kachina	505DSP HF transceiver	N1VXW	AUG 27
MFJ	MFJ-214 Linear Amp. Saver	NZ9E	OCT 18
MFJ	MFJ-224 2m FM Analyzer	NØBLX	MAR 36
NHRC Repeater Controllers	Build the NHRC-4 Linking Rptr. Cntrlr.	N1KDO	SEP 28
Paddlette Company	Paddlette Micro Keyer	WB8VGE	FEB 37
Pasokon	3.1 SSTV System	KB1UM	JUL 31
Ten-Tec	1210 T-Kit	W9NUP	FEB 39
Velleman Electronics	K2659 Morse Decoder Kit	N1FN	DEC 29
Whiterook	Model MK-88 Pocket Electronic Keyer	AD1B	AUG 42
Yaesu	VX-1R Micro Dual-band HT	KB1UM	JUN 32

Reviews (by product)

3.1 SSTV System	Pasokon	KB1UM	JUL 31
1210 T-Kit	Ten-Tec	W9NUP	FEB 39
AX384 & AX576 High Speed Packet Modems	GMSK Data Products	G3LDI	MAY 40
CC432-5 Receive Converter Kit	Hamtronics	WB9RRT	APR 37
CodeKey	Advance Design Labs	KB1UM	FEB 68
Computer Controlled HF Transceiver	Kachina	N1YXW	AUG 27
DJ-C5 Transceiver	Alinco	VE3EGA	DEC 24
ID-8 Morse Station IDer	Comm Spec	K4CHE	MAR 46
K2659 Morse Decoder Kit	Velleman—Seeing Dits and Dahs	N1FN	DEC 29
MFJ-214 Linear Amp. Saver	MFJ	NZ9E	OCT 18
MFJ-224 2m FM Analyzer	MFJ	NØBLX	MAR 36
MK-88 Pocket Electronic Keyer	Whiterook	AD1B	AUG 42
NHRC-4 Linking Rptr. Cntrlr.	NHRC Repeater Controllers	N1KDO	SEP 28
Paddlette Micro Keyer	Paddlette Company	WB8VGE	FEB 37
SatTrack System	C&S Engineering	KAØSNL	JAN 32
TiCK Kit	Embedded Research	K4CHE	OCT 33
TR Series Vintage Equipment	Drake	W2BLC	DEC 52
VX-1R Micro Dual-band HT	Yaesu	KB1UM	JUN 32

RTTY

RTTY Loop	Letter time	WA3AJR	JAN 75
RTTY Loop	AEA	WA3AJR	FEB 71
RTTY Loop	Kiingenfuss's CD	WA3AJR	MAR 74
RTTY Loop	Klingenfuss 1998 Radio Station Guide	WA3AJR	APR 74
RTTY Loop	Teleprinter ribbons	WA3AJR	MAY 78
RTTY Loop	Letters	WA3AJR	JUN 57

RTTY Loop	22nd year Anniversary	WA3AJR	JUL 63
RTTY Loop	Letters from readers	WA3AJR	AUG 63
RTTY Loop	Elmers Web site	WA3AJR	SEP 55

Satellite Operation, EME, Space

Hamsats	Space symposium	W5ACM	JAN 54
Hamsats	Soviet space	W5ACM	FEB 52
Hamsats	Are radio nets dead?	W5ACM	MAY 71
Hamsats	*Satellite Experimenter's Handbook*	W5ACM	JUN 58
Hamsats	European Space Agency, Arianespace	W5ACM	AUG 56
Hamsats	*Ariane 503* and *Phase 3D*	W5ACM	SEP 98
Hamsats	*TMSAT-1, Gurwin-II Techsat*	W5ACM	OCT 40
Hamsats	*SEDSAT-1*, ARISS	W5ACM	DEC 45

Test Equipment

Already Have an Oscilloscope?	A cheaper add-on capacitor tester	N4MCZ	NOV 57
An FET Probe to MMIC	Relatively new tech for your test bench	W6WTU	AUG 48
Bridge Over Troubled Watters	RF impedance bridge	NØBLX	MAR 67
Don't Leave Home Without It	Ingenious tester for wallet or purse	W2UW	MAR 64
High Impedance Analog Volt/Test Meter	Useful gadget to build	W6WTU	MAR 26
In Search of a Simple Capacitor Tester	Construction project	KD6ORG	AUG 68
Penny Pincher's Digital Ammeter	Inexpensive, accurate, seaworthy	N4UAU	MAY 32
The ZenerMeter	Test set for zener and other diodes	KA4J	MAR 39
VHF/UHF Signal Source	Another piece of test equipment	W6WTU	NOV 21

Tutorial

Adventures in Regulation	How to use a fixed voltage regulator	W6WTU	APR 64
A Pleasant Visit to the DDS	Direct Digital Synthesis	W6WTU	MAY 15
Ask Kaboom	Sound!	KB1UM	JAN 58
Ask Kaboom	I'm bored!	KB1UM	FEB 50
Ask Kaboom	New modes: Packet voice	KB1UM	MAR 55
Ask Kaboom	Trends	KB1UM	APR 52
Carr's Corner	Randomness; SESCOM Lab-x	K4IPV	JAN 79
Carr's Corner	More on Magnetometers	K4IPV	FEB 74
Carr's Corner	Internet: Its meaning to ham radio	K4IPV	MAR 50
Carr's Corner	Receiving loops & loop preamps	K4IPV	APR 55
Carr's Corner	Receiving loops... Part 2	K4IPV	MAY 54
Carr's Corner	SETI League, Hospital Operations	K4IPV	AUG 52
Carr's Corner	Receiver accessories	K4IPV	NOV 54
Carr's Corner	Hybrid couplers	K4IPV	DEC 42
Cool It!	Keep your transiters cooler	W2GOM/7	AUG 24
Determining Ant. Feedpoint Impedance	Theory, finding element impedance	W6WTU	AUG 64
Electronic Construction from A to Z, Pt. 3	Everything you wanted to know	N1FN/VK5FN	JAN 22
Electronic Construction from A to Z, Pt. 4	Conclusion: You can be Mr. Fix-It!	N1FN/VK5FN	FEB 44
FM Revisited	Modulation	W6WTU	JUL 21
Intro to Superhets	Part 1: History and overview	W6WTU	AUG 38
Intro to Superhets	Part 2: From oscillators to detectors	W6WTU	SEP 22
Intro to Superhets	Part 3: Accessories and conclusion	W6WTU	OCT 26
Keys to Better Operating	Much of it *is* common sense	W6BNB	DEC 17
Meeting Your Match	Understanding matching networks	W2GOM/7	OCT 47
The Digital Port	Modems	KB7NO	SEP 39
The Ins and Outs of Surface-Mount	Everything you need to know...	Davidson	OCT 10
Secrets of Deviant Behavior	Measuring FM deviation	W6WTU	AUG 18
Sensitivity Training	Increasing receiver sensitivity	W2GOM/7	MAY 19

Updates

Beeper Short Circuit Detective	DEC 1997	Ham to Ham	MAR 84
Automatic Morse Station IDer	MAR 1998	K4CHE	APR 87
Limited Space Antenna	DEC 1997	K2KSY/HL9BK	JUL 87
SatTrack	JAN 1998	KAØSNL	MAR 84

VHF/UHF

Above & Beyond	Frequency counters; accuracy	WB6IGP	JAN 60
Above & Beyond	Freq. reference oscillator stability	WB6IGP	FEB 63
Above & Beyond	Filters for ham microwave bands	WB6IGP	MAR 74
Above & Beyond	Oscillator considerations/1296 MHz	WB6IGP	APR 50
Above & Beyond	Surplus 1152 MHz synthesizer	WB6IGP	MAY 50
Above & Beyond	Bits and pieces for microwave & VHF	WB6IGP	JUN 61
Above & Beyond	Making antenna measurements	WB6IGP	JUL 50
Above & Beyond	Test equipment, junkyard acquisitions	WB6IGP	AUG 50
Above & Beyond	How to repair old beam antennas	WB6IGP	SEP 36
Above & Beyond	VHF to microwave preamplifiers	WB6IGP	NOV 42
Above & Beyond	HP power meters/thermistor mounts	WB6IGP	DEC 39

SPECIAL EVENTS

Listings are free of charge as space permits. Please send us your Special Event two months in advance of the issue you want it to appear in. For example, if you want it to appear in the April '99 issue, we should receive it by January 31. Provide a clear, concise summary of the essential details about your Special Event.

JAN 9

LOVELAND, CO The Northern Colorado ARC will host their Winter Superfest 9 a.m.–3 p.m. at the Larimer County Fairgrounds, 700 Railroad Ave. VE exams, commercial exhibits, computer and radio goodies, and more. Reserve tables from *Jeanene Gage NØYHY (970) 351-7327.* General info *(970) 352-5304.* Talk-in on 145.115 (-100 Hz), or 146.85(-).

JAN 10

SOUTH BEND, IN The 22nd Annual South Bend Hamfest & Computer Expo will be held at the Century Center, located at US 33 N. and Jefferson Blvd. The Michiana Valley Hamfest Assn. will host this event 8 a.m.–3 p.m. There will be a large flea market with setup at 6 a.m. on Sunday. 5-foot round tables are $5 ea., 8-foot rectangular tables are $15 each. 8-foot rectangular wall tables are $20 each. Electric power $26.25; please state whether you want it or not. Advanced tickets $4 ea. For info or ordering, please send a business size SASE to *Michiana Valley Hamfest Association, 21970 Kern Road, South Bend IN 46614, or contact Denny KA9WNR, M-F 7 p.m.–10 p.m. EST at (219) 291-0252.* Talk-in on 145.290(-). Several motels/hotels have offered discount rates for Sat. Jan. 9th; ask for "South Bend Hamfest discount rate." Make reservations early, discount rates expire Dec. 20th. Holiday Inn Downtown, (219) 232-3941, 1–4 persons, $79, pool. Marriott Hotel, 1-800-328-7349, 1–4 persons, $64, pool. Super 8 Motel, (219) 272-9000, 1–2 persons, $51; 3–4 persons, $65 (7267); continental breakfast. Days Inn, (219) 277-0510, 1–4 persons, $42; continental breakfast (29889). Best Inn, (219) 277-7700, 1–2 persons, $44; 3–4 persons, $51, continental breakfast.

JAN 16

HAMMOND, LA The Southeast Louisiana ARC, Inc., will present the 19th annual SELARC Hammond Hamfest at University Center on University Drive. Easy access via I-12, I-55, US 51, or US 190. Free admission, free parking. VE exams; MARS, QCWA, ARES forums. To request more info, write to *Southeast Louisiana Amateur Radio Club, Inc., P.O. Box 1324, Hammond LA 70404.*

ST. JOSEPH, MO The Missouri Valley ARC and Ray-Clay ARC will hold their 9th annual Northwest Missouri Winter Hamfest 8 a.m.–3 p.m. at the Ramada Inn, I-29 and Frederick Ave. (Exit 47 on I-29), in St. Joseph MO. There will be special room rates for hamfest participants. VE exams, major exhibitors and flea market all indoors. Free parking. Advance tickets $2 each or 3 for $5; at the door $3 each or 2 for $5. Pre-registration requests received after Jan. 5, 1999, will be held at the door. Dealers: Swap tables $10 each for the first two tables. Commercial exhibitors welcome. Write for details: *Northwest Missouri Winter Hamfest, c/o Gaylen Pearson WBØW, P.O. Box 1533, St. Joseph MO 64502, or E-mail [WBØW@IBM.Net].*

JAN 17

HAZEL PARK, MI The Hazel Park ARC will hold its 33rd Annual Swap & Shop on Jan. 17, 1999, at the Hazel Park High School, 23400 Hughes St., Hazel Park MI. The public is welcome 8 a.m.–2 p.m. General admission is $5 in advance or at the door. Plenty of free parking. Tables $14; reservations for tables must be received with a check. No reservations by phone. Talk-in on 146.64(-), the DART rptr. For info about the swap, tickets, or table reservations, mail to *HPARC, P.O. Box 368, Hazel Park MI 48030.*

RICHMOND, VA The Richmond Amateur Telecommunications Society (RATS) will hold "Frostfest 99" at the Showplace-3000, Mechanicsville Tpke. I-95 exit 75 to I-64 East, then exit 192 (Rt. 360 East), go 1/2 mi. on left. Hours 8:30 a.m.–3:30 p.m. with indoor dealers, flea market, forums. Handicapped accessible. Admission $6. Write to P.O. Box 14828, Richmond VA 23221-0828. For general info call *(804) 739-2269, ext. FEST.* The Web site is at *[http://frostfest.rats.net].* Talk-in on 146.88.

YONKERS, NY The Metro 70 cm Network will present another Giant Electronic Flea Market at Lincoln High School, Kneeland Ave., Yonkers NY, 9 a.m.–3 p.m., rain or shine. No tailgating. Indoor flea market only. Vendors: $19 1st table, $15 each additional table. All tables 30" x 5', or bring your own tables at $14 for a 6'-0" space. At the door, $25 each table, $20 for a 6'-0" space. Full payment is due with registration. The Giant Electronic Flea Market will also be held on May 2nd and Sept. 26th, so there is a special offer for vendors who want to register for all three events: $16 1st table, $13 each additional table. All 6'-0" spaces $13 each. Full payment for all three events is due with registration. No paid reservations for space will be held past 9 a.m. No refunds given unless prior notification of cancellation has been received 72 hours in advance of each event. Donation $6, kids under 12 admitted free. Table setups at 7 a.m. For registration, call *Otto Supliski WB2SLQ, (914) 969-1053.* Mail paid reservations to *Metro 70 cm Network, 53 Hayward St., Yonkers NY 10704.* We will return a receipt showing the amount paid and the table or space location reserved. Show receipt at the door for entry. Talk-in on 440.425 MHz PL 156.7; 223.760 MHz PL 67.0; 146.910 MHz; and 443.350 MHz PL 156.7.

JAN 24

DOVER, OH The Tusco ARC Hamfest will be held Sun., Jan. 24th, at the Ohio National Guard Armory, 2800 North Wooster Ave., Dover OH. Exit Interstate 77 at exit #87 (Strasburg)—turn right at the exit stop sign, heading south on County Road 74 to the first traffic light. Continue through the traffic light intersection. The armory is on the right. Admission, $2 donation at the door. Tables $8 each. Open 6 a.m. for setup, 8 a.m.–12 noon for the public. Food available on site and at the restaurant next door, which opens at 7 a.m. For additional info and to reserve tables, contact *Howard Blind KD8KF, 6288 Echo Lake Rd., N.E., New Philadelphia OH 44663. Tel. (330) 364-5258.* Talk-in/check-in on 146.730(-).

VILLA PARK, IL The Wheaton Community Radio Amateurs will host their 32nd Mid-Winter Hamfest at the Odeum Exposition Center, 8 a.m.–2 p.m. The Hamfest and Electronic Flea Market will include commercial booths in the North Hall. Reserved flea market tables in the South Hall and Mezzanine, computers and software, acres of parking, and VE exams on site. Gordon West will present a seminar. Tickets $6 in advance (with four prize stubs), or $8 at the door. Mail advance ticket payments by Jan. 8th to be sure you will be in the prize barrel. Make checks payable to *WCRA.* Send with a business size SASE to *WCRA, P.O. Box QSL, Wheaton IL 60189. Tel/FAX (630) 665-7757.* Free bus service from remote parking; see the map on the Web site at *[www.w9ccu.org].*

JAN 30

ALBUQUERQUE, NM The Albuquerque Winter Tailgate Swapfest will be held Sat., Jan. 30th, 8 a.m.–2 p.m., (weather permitting) at the Del Norte High School parking lot, at the corners of Montgomery and San Mateo Blvds. Admission is free. For more info please contact *Tom Ellis K5TEE, 912 Lomas Ct. NE, Albuquerque NM 87112-5515. E-mail [K5TEE@QSL.NET]. Tel. (505) 291-8122.*

FEB 6

NO. CHARLESTON, SC The 26th Annual and Original Charleston Hamfest and Computer Show will be held Feb. 6th at the Stall High

Number 43 on your Feedback card

Ham to Ham

Your Input Welcome Here

Dave Miller NZ9E
7462 Lawler Avenue
Niles IL 60714-3108
E-mail: [dmiller14@juno.com]

It's the January issue again already, so Sue (KA9UCK) and I would like to take this opportunity to once again wish everyone a Happy New Year.

I would also like to encourage readers to keep sending in their tips, ideas, suggestions and shortcuts for a bigger and better "Ham To Ham" column next year. Just send your ideas to the address (postal or E-mail) shown above, and there's a good chance you'll see them in print in the coming year.

Keeping a cool watch

What's perhaps the easiest way to destroy an expensive modern computer microprocessor chip? Heat! Today's computer microprocessors are compact, fast and reasonably robust, but they need to be kept cool to do all that they're called upon to do quickly. Most desktop computer microprocessors are fitted with a husky heat sink and a 12 VDC cooling fan to help maintain a safe case operating temperature for the device—but lacking forced cooling, a high-speed processor can destroy itself pretty quickly via thermal runaway. But how would you even know if your processor's case temperature was too high? Perhaps, not until it was too late!

One day, the sleeve-bearing fan on my Pentium® microprocessor gave out without my knowledge. Fortunately, I noticed that the computer was behaving oddly before the microprocessor was damaged, but I was lucky! After that incident, I installed a ball-bearing fan for the processor (which will hopefully provide longer life) as well as a processor heat sink temperature indicator in the form of an inexpensive indoor/outdoor automotive digital thermometer.

I wanted a thermometer that would neatly fit on a standard 1-3/8-inch by 5-3/4-inch computer single-bay blank panel, and I found what appeared to be the perfect one at my local automotive supply store—it measures about 1-1/8 inches by 4-1/2 inches. It was made for use inside an auto or van, and came with an "outdoor" temperature probe coupled by about 10 feet of small two-conductor wire. I used this probe as my processor's temperature sensor, trimming the 10-foot interconnecting cable down to just what I needed to reach from the computer's empty front-panel bay to the processor's heat sink; I also installed a small two-pin in-line

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School, near Ashley Phosphate Road in No. Charleston. No tailgating allowed until all tables are sold inside. Tickets $5 at the door (includes one prize ticket). Additional prize tickets are $1 each, or six for $5. Children under 12 admitted free. Pre-registered tables $8 per 8 ft; at the door $10 as long as they last. Make checks payable to *C.A.R.S. Hamfest Committee*, enclose an SASE, and send to *Jenny Myers WA4NGV, 2630 Dellwood Avenue, Charleston SC 29405-6814*. ARRL, Natural Disasters, and other forums will be held. BINGO for spouses and harmonics. VE exams will be given on site. Please bring the original and a copy of your amateur license, any CSCEs you have, and two IDs, one with a photo. All testing will be on a walk-in basis and will begin at 12 noon. For further info, call *Ed KE2D at (843) 871-4368, or E-mail [efrank@charleston.net]; or call Doc W4MUR at (843) 884-5614.*

FEB 13

HARRISBURG, PA The Harrisburg Radio Amateur Club will hold a Valentine Hamfest, Sat. Feb. 13th, at the Oberlin Fire Company in Harrisburg. Directions: I-283 to Swatara PA-441 Exit (#1). Turn north onto PA-441 (toward Bob Evans Restaurant). Turn left at the traffic light onto Eisenhower Blvd. Turn right at the next traffic light, remaining on PA-441. Turn at the stop sign. The Fire Hall is 0.2 mi. on the right. There will be signs from I-283. General admission at 8 a.m., $2; sweethearts, XYLs, and harmonics free. Table setup at 6 a.m. Friday night setup if needed. VE exams will be conducted nearby at 9 a.m. Tables are $8 in advance. Very limited tailgating, $2. For table registration, contact *N3NJB, 2501 S 2nd St., Steelton PA 17113-3009. Phone (717) 939-4825; or E-mail [n3njb@juno.com].*

FEB 14

MANSFIELD, OH The Mansfield Mid*Winter Hamfest/Computer Show will be held Sun., Feb. 14th, at the Richland County Fairgrounds, Mansfield OH. Doors open to the public at 7 a.m. Tickets $4 in advance and $5 at the door. Tables $10 in advance and $12 at the door, if available. For additional info or advance tickets/tables, send SASE to *Pat Ackerman N8YOB, 63 N. Illinois Ave., Mansfield OH 44905*, or phone *(419) 589-7133 after 2 p.m. EST.*

FEB 20

RICKREALL, OR The Salem Repeater Assn. and Oregon Coast Emergency Repeater, Inc., will present the 1999 Salem Hamfair & Computer/Electronic Swapmeet, Sat., Feb. 20th, at the Polk County Fairgrounds in Rickreall. Doors open at 9 a.m. Pre-registrations postmarked by Feb. 5th will receive an extra door prize ticket with each registration. Registrations received on or after Feb. 14th will be held for pickup at the door. Participants 13 years of age or older must be registered to enter the hamfair. For pre-registration, contact *Evan Burroughs N7IFJ at (503) 585-5924 (before 8 p.m.), or E-mail to [n7ifj@teleport.com]*. Swap table setup will be Fri. night, 6 p.m.–9 p.m. and Sat. morning at 7 a.m. Self-contained RV spaces available. Features include: swap tables, commercial dealers; meetings—ARRL, ARES/RACES, and others as announced. No VE testing is planned. For more info contact the Web site at *[http://sra.goldcom.com/sraflyer.htm]*. Talk-in on the 146.86 rptr.

FEB 28

ANNANDALE, VA The Vienna Wireless Society will conduct its 23rd Winterfest on Sun. Feb. 28th, 1999, at the Annandale (VA) campus of the Northern Virginia Community College, in the gymnasium of the Ernst Cultural Center. Admission $5, XYL free. Tailgating starts at 6 a.m. in the parking lot south of the Ernst Cultural Center. The $10 tailgate fee includes admission. VE exams begin at 8 a.m. sharp. Walk-ins permitted. For more info, call *Jim Parsons WA4LTO at (703) 392-0150, or E-mail [k3mt@erols.com]*. The Web site is at *[http://www.erols.com/k3mt/vws]*.

SPECIAL EVENT STATIONS

JAN 26–27

ST. LOUIS, MO All Amateur Radio Clubs of St. Louis (MO) will sponsor Special Event Station WØK during the papal visit of Pope John Paul II, Jan. 26–27, 1999. Operations from the Monsanto Amateur Radio Assn. shack will be on 10–80 meters, 24 hours per day. QSL with #10 SASE via *Rev. Mike Dieckmann KAØIAR, 703 Third St., Hillsboro MO 63050 USA.*

FEB 13–14

ALEXANDRIA, VA The Mount Vernon ARC will operate K4US 16:00Z–21:00Z Feb. 13–14 to commemorate George Washington's Birthday. Transmission will take place from Mt. Vernon (VA). Frequencies include 7.240 MHz, 14.240 MHz sideband and 10.110 MHz or 18.080 MHz CW. For an 8-1/2" x 11" certificate, send QSL and SASE to *MVARC, P.O. Box 7234, Alexandria VA 22307.*

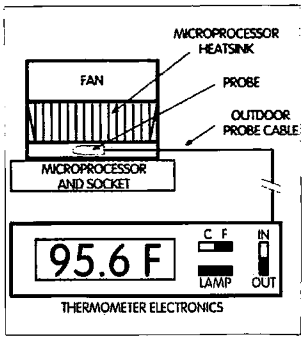


Fig. 1. An automotive digital thermometer may be used to keep careful watch over the heat sink temperature of a computer's microprocessor.

connector in the cable. The remote sensing probe needs only just to touch the processor's heat sink, so I was able to put a small adhesive cable clamp on the socket rim that holds the microprocessor, to accomplish what was needed in the way of a tie-down for the probe. A spare 1-3/8-inch by 5-3/4-inch computer single-bay blank panel was then drilled to pass the remote sensor's cable, and the thermometer itself was attached to the panel via double-stick adhesive foam pads, to complete the modification (see **Fig. 1**).

The "indoor" position on the thermometer's probe selector switch now reads the computer's exterior case temperature (room temperature), and the "outdoor" position reads the heat sink temperature of the microprocessor itself, buried deep within the computer. The automotive thermometer that I found places the LCD display at a 45° angle, which makes it very easy to read even in subdued lighting. The electronics for the thermometer operate from a pair of built-in "AA" alkaline cells, and should provide a reasonably long service life (so the thermometer is on, even when the computer is off). I didn't feel the need to try adapting power from the computer itself to run the thermometer, but I'm sure that it could be done. The five-volt bus from the computer's supply could be tapped, and a simple series resistive voltage dropping circuit added if you prefer to be freed from ever having to change the batteries in the little digital thermometer. The added current drain of the thermometer would be insignificant.

There are no doubt more elaborate ways of monitoring the temperature of the microprocessor's heat sink than what I've described above, but I was shooting for simple, inexpensive and easily accomplished ... which I feel that this answer was. A programmable audible alarm would be nice too, but that will have to wait for a later column.—de NZ9E.

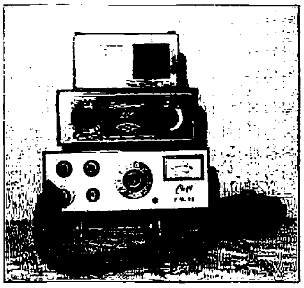


Photo A. WB9YBM's modified Clegg FM-76 transceiver is shown, along with samples of his outboarded synthesizers and deviation meter. If done professionally, add-ons can actually enhance the resale value of "middle-aged" ham equipment. See the full text for further details. (Photo provided by Klaus Spies WB9YBM.)

Ahhh, middle age!

From Klaus Spies WB9YBM: Here's some advice on how to deal with middle age ... in radio gear, that is: "While much is written about both brand new and very old (antique) radio equipment, the most neglected group seems to be those radios in their 'middle years' ... and they can be a very attractive buy!

"In the mid-seventies, there appeared a series of VHF transceivers for the 144 MHz and 220 MHz bands that were nearly identical, except for the front panel name plate. Clegg, Cobra and Midland all had 12-channel, crystal-controlled transceivers that can still be seen in many shacks, packet BBSs and repeater sites across the country. They've especially found homes in repeater usage because their receiver and transmitter boards are easily separated (for split receive/transmit sites) and, like the famous bunny, they seem to just keep on going.

"The unit pictured in **Photo A** is typical. It originally came equipped with a four-pin connector on the rear apron, which was designed to provide easy access for adding a Touch-Tone® pad or a discriminator output meter. Also, unlike the cluttered rear aprons of today's transceivers, there was plenty of additional room for adding connectors to bring signals in and out for frequency synthesizers and other useful add-ons ... pretty much as the owner deemed necessary.

"Likewise, there was actually extra space inside the cabinet for carefully adding small PC boards for additional features, something that's nearly impossible to do in many of the current sets. If the extras are conscientiously built, they can actually be a bonus, rather than a hindrance, at resale.

"Here are a few considerations to keep in mind if you decide to add on to one of these transceivers. Obviously, every effort should be made to keep any add-on circuits reliable and low-profile, as well as to make sure that any conductive surfaces are well insulated. It takes just a bit of carefully placed and secured waxed cardboard to keep everything isolated, so that unforeseen shorts won't occur. Try to keep any add-on boards well away from existing RF circuitry, and digital logic boards should never be placed near low-level audio stages where the clock pulses can end up being induced into your transmitted audio signal. A little time and effort in studying the problem at the onset (perhaps even sleeping on it) will pay big dividends.

"Another advantage to middle-aged ham transceivers is their use of 'standardized' (rather than specialty) components and semiconductors. There are almost always cross-reference equivalents available for the bulk of the parts used in these sets, and even more modern parts can sometimes be substituted if all other avenues for replacements fail. All in all, middle-aged ham equipment can be a very good buy, especially considering the fact that most of the initial purchase depreciation has already been assessed. So keep your eyes and ears open at hamfests, auctions, equipment trader publications, Internet swap pages, etc., for these unsung bargains. See you at the next 'fest!"

Do it your way!

From Herb Foster AD4UA: "If you're 'borrowing' 12 VDC from your HF transceiver's power supply, and you've ever experienced a sudden, unannounced power supply shutdown, then maybe it's because your transceiver's power supply is being strained very close to its limits. It's tempting to simply hook up a number of peripherals across a transceiver's matching supply ... after all, it's just a few milliamperes here and there! It's so easy to lose count, but after some time, those few mils here and there add up! The result, of course, is an unceremonious shutdown of everything, and usually at the worst possible time, if Murphy has any say in the matter!

"My own solution to this situation was to buy a separate three-ampere regulated 12-volt power supply from Radio Shack®, along with the parts shown on the schematic in **Fig. 2** from their parts pegboards, and (happily) the problem has disappeared from my operating desk.

"It's an obviously simple solution, but often one that we keep putting off until we see how someone else has done it. My new three-amp 12-volt supply feeds into a project box via a short length of #18 gauge lamp cord and a three-ampere fuse, where it is paralleled off to six chassis-mounted, RCA phono

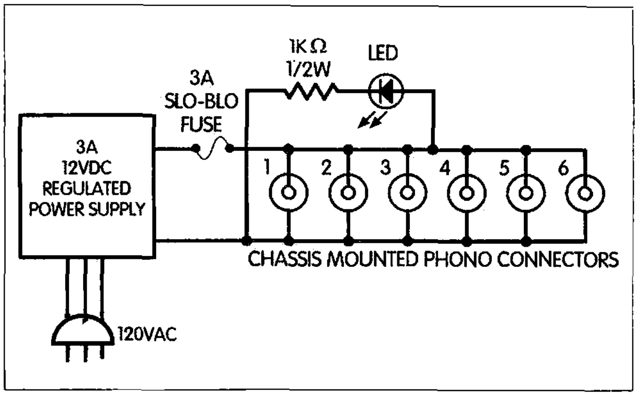


***Fig. 2.** Easily-duplicated 12 VDC auxiliary power distribution box idea suggested by Herb AD4UA. See the text for a full description.*

jacks (use as many jacks as you think you'll need for now and the future). All of my 12-volt peripherals can now be plugged directly into the new 12-volt DC distribution box and easily connected and disconnected as desired.

"Use whatever style plugs and jacks that you wish, but the type specified are very inexpensive, fairly well-made, and will carry the peripheral current with little or no voltage drop. Of course the female connector should always be on the power supply side, and the male connector on the equipment side. Using only phono connectors with red plastic shells, or painting the connectors with red model airplane paint, will alert you to the fact that this is a power connector, not an audio cable.

"**Photo B** shows you how mine turned out, but feel free to add as many frills as you think might be worthwhile (such as an LED to show that power is being supplied to the box, or even a small inexpensive panel-mounted digital voltmeter). There are some commercially-made voltage 'breakaway' boxes on the market, but this one is a whole lot less expensive and it gives you the freedom to do it your own way!"

Murphy's Corollary: When all of your problems become crystal clear, that's the time when you need to begin worrying!

Many thanks, as always, to our loyal contributors. Remember, I'm always looking for interesting and innovative tips, ideas, suggestions and shortcuts to include on the pages of *73 Magazine* within this column.

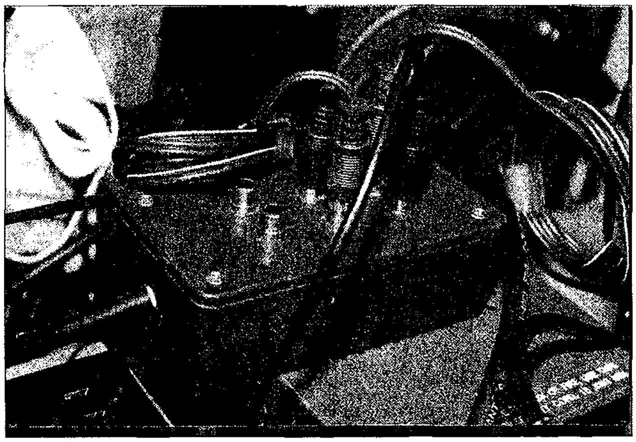


***Photo B.** Herb Foster's home-brewed 12-volt DC distribution box is shown neatly tucked away amid the equipment on his operating desk.*

Just jot down your thoughts and send them to the address at the masthead.

Those who accepted the challenge this month are:

Klaus Spies WB9YBM
1709 Dennis, Apt. 3A
Mount Prospect IL 60056

Herb Foster AD4UA
3020 Pennsylvania Street
Melbourne FL 32904-9063

If you're missing any past columns, you can probably find them at *73's* "Ham To Ham" column home page (with special thanks to Mark Bohnhoff WB9UOM), on the World Wide Web, at: [http://www.rrsta.com/hth].

Note: The ideas and suggestions contributed to this column by its readers have not necessarily been tested by the column's moderator nor by the staff of *73 Magazine*, and thus no guarantee of operational success is implied.

Always use your own best judgment before modifying any electronic item from the original equipment manufacturer's specifications. No responsibility is implied by the moderator or *73 Magazine* for any equipment damage or malfunction resulting from information supplied in this column.

We will make every attempt to respond to all legitimate ideas in a timely manner, but please send any specific questions, on any particular tip, to the originator of the idea, not to this column's moderator nor to *73 Magazine*.

Number 46 on your Feedback card

HAMSATS

Amateur Radio Via Satellites

Andy MacAllister W5ACM
14714 Knights Way Drive
Houston TX 77083

The AMSAT 16th Annual Space Symposium and General Meeting got off to a superb start at the Battlefield Inn near the Yazoo River in Vicksburg, Mississippi. Attendees began showing up around midday Thursday, October 15th. The Vicksburg Amateur Radio Club, working in conjunction with the local AMSAT Group, provided registration services. Those who came were welcomed with packets of information about the meeting, symposium, and local attractions. Event organization was excellent.

Friday

Activities on Friday morning began promptly at 8:30 a.m. with introductory comments by Russ Tillman K5NRK, the symposium chairman. Unlike many ham radio conventions that only last a day, usually peaking during the morning hours of a Saturday, the AMSAT Space Symposium gets moving on Thursday night and continues all weekend through Monday of the following week.

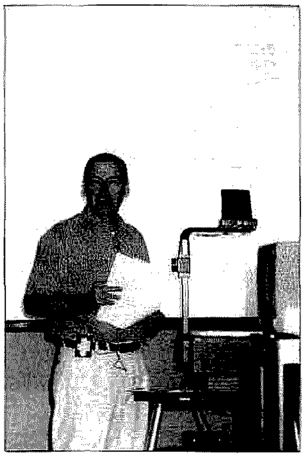


***Photo A.** Dr. Martin Davidoff K2UBC, author of the* Radio Amateur's Satellite Handbook, *got the presentations rolling with his amateur radio satellite history.*

Dr. Martin Davidoff K2UBC made the first presentation, with a brief history of the amateur satellite program. Marty's long association with the program brought out many bits of obscure, yet fascinating, facts about the early satellites. Did you know that *OSCAR-1* went up on a military launch, or that *AMSAT-OSCAR-6* required daily commands from the ground to stay on the air? How about the history of *Phase 3A*? This satellite was lost on the second flight of an *Ariane* rocket in May 1980. It was the first ham satellite to have its own kick motor for orbital maneuvers.

Chuck Duey KIØAG gave the second Friday talk, complete with slides, on his efforts to make contacts from over 100 grid squares via satellite. While many have obtained the ARRL VUCC award via the hamsats, Chuck has made it a personal goal to travel to over 100 grid squares, mostly in western states and Alaska, and operate portable via every available voice and CW-mode *OSCAR*. The heart of his station is the Yaesu FT-847. His antennas range from quarter-wave whips on the HF bands to beams and M-Squared "egg-beaters" for the VHF and UHF bands. Following his talk, Chuck took his gear, and most of the symposium attendees, to the parking lot for a live demonstration of his portable system via *AMRAD-OSCAR-27*. Chuck used an HT in conjunction with the Arrow Antenna hand-held dual-band yagi. Several other Arrow antennas were also in evidence from others in the group. Vicksburg dominated the satellite during the pass.

***Photo B.** Chuck Duey KIØAG and many others took a break from the presentations to chase* A-O-27 *from the parking lot of the Battlefield Inn in Vicksburg, Mississippi.*

After the long break for satellite chasing, Ken Ernandes N2WWD took the group through a technical session describing the advantages of intermediate circular orbits for amateur satellites. Most hamsats are in low circular orbits, with the current exception of *AMSAT-OSCAR-10*, with its high elliptical orbit.

As we approach the year 2000, many hams have begun to recognize that there are programs and other applications that are sensitive to date and time changes. Satellite tracking is no exception. Roy Welch WØSL talked not only about concerns and fixes associated with AMSAT satellite-tracking software, but also about potential hardware and firmware Y2K problems in computers.

Most AMSAT software has been checked for compliance with the date change to the year 2000. The programs that have shown problems have been modified. Software authors have been provided with guidelines to use when writing new software or modifying legacy code. Roy also provided some good simple tests that can be

***Photo C.** Bill Tynan W3XO makes a quick contact with KIØAG's HT via* A-O-27.

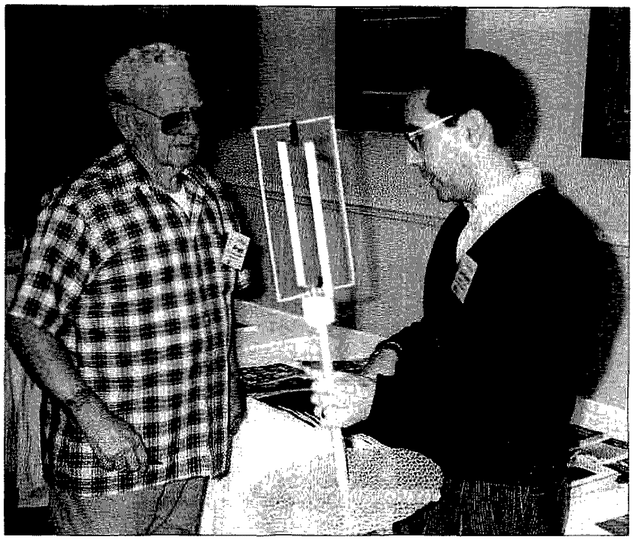


***Photo D.** Anthony AA2TX explains the fundamentals of his modified double-loop 70 cm antenna to one of the AMSAT members.*

tried on PCs to check for problems in the internal BIOS. Some good Internet sites to check for PC Y2K tests include [http://www.rightime.com] and [http://www.dell.com].

John Melton GØORX finished Friday morning with a presentation about his efforts to design automated satellite ground station software written in Java®. He first presented his work at the 1997 AMSAT symposium in Toronto, Canada. John has made his software

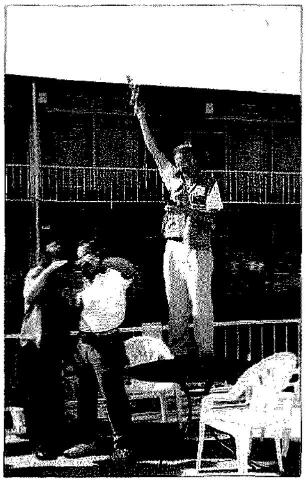


***Photo E.** Bob Bruninga WB4APR gets a little extra elevation while monitoring a 9600-baud digisat using the new Kenwood HT at the AMSAT Space Symposium.*

available via the Internet at [http://www.qsl.net/n6lyt]. More changes are in the works, but the initial iteration offers the promise of working on any system that will support the Java 1.1 Virtual Machine™, like your Internet browser software.

One of the biggest problems with satellites is the fact that all of the amateur radio satellites move with respect to the users. Our hamsats are not geostationary like the TV satellites. The use of directional antennas for hamsat chasing requires that the user aim the antennas while the satellite travels across the sky. While this can be done with

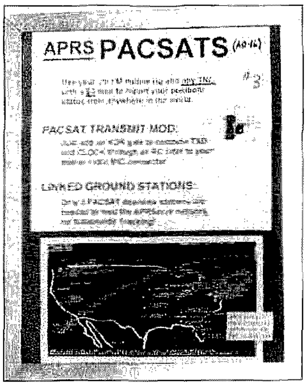


***Photo F.** A $3 mod to a standard TNC can make it compatible with the required uplink signal for* A-O-16. *The result is simple APRS via* A-O-16.

computers and the appropriate software and interface hardware, it is usually done by hand while attempting to tune out Doppler shift and keep up with a conversation through the satellite transponder. Many hams have tried simple antennas for satellite work that do not require aiming, usually with marginal results or serious compromises. Anthony Monteiro AA2TX has been experimenting extensively with a modified double-loop antenna for 70 cm reception. His paper, as presented in the *Proceedings of the AMSAT 16th Annual Space Symposium*, described the problems and solutions associated with simple omnidirectional antennas. His antenna is very similar to an M-Squared eggbeater, with a few changes to optimize it for space communications. Complete dimensions are given in his paper, along with antenna modeling plots and real-world results.

Bob Bruninga WB4APR, of APRS (Automatic Position Reporting System) fame, was next. He was hard to miss in the white hardhat resplendent with digital-ready HT, SSTV camera-mike, and GPS receiver. This really got the attention of the audience. Bob provided some introductory material, and then reported on advances in the APRS network and the potential uses of the Kenwood SSTV mike and dual-band packet-ready (TNC inside) HT.

His talk, however, focused on the use of 1200-baud pacsats such as *AMSAT-OSCAR-16* for APRS experiments. While many areas of the United States have terrestrial APRS system coverage, using the pacsats would provide global coverage. Sending data to a pacsat requires about 25 watts to an omnidirectional antenna on two-meter FM, a TNC (Terminal Node Controller) with a minor modification to provide Manchester encoding, and a PC. The pacsat downlink is not easy to receive, but for APRS purposes, the uplink of locational data is the most important part of the equation. A few stations

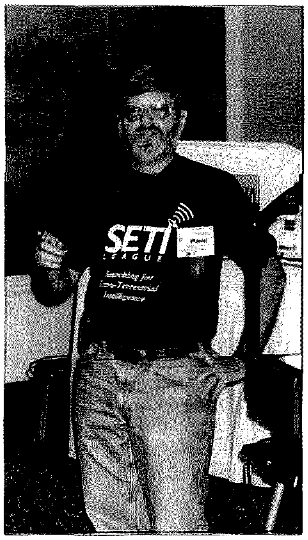


***Photo G.** Dr. Paul Shuch N6TX explained advances for cheap SETI receive gear.*

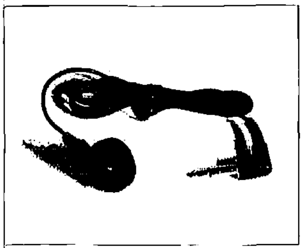
around the world receive the APRS data from the pacsats and make it available via the Internet and other APRS channels. Check out Bob's site at [http://web.usna.navy.mil/~bruninga/aprs.html].

Dr. Paul Shuch N6TX has become a regular at the AMSAT meetings in recent years. His talk, "SETI on the Cheap: Affording the Ultimate DX," provided an update on some of the programs and hardware now under development for use by individuals in the Search for ExtraTerrestrial Intelligence. In addition to the serious technical side of his material, Paul always succeeds in bringing some levity to the day with his guitar and songs.

Dr. Bob Twiggs KE6QMD, of Stanford University, was part of the last afternoon session. Bob detailed efforts with a class of small satellites called nanosats. While microsats have been loosely defined as payloads in the 10 kg (22 pounds) category, nanosats are to be about one kg (2.2 pounds) in weight with a similar reduction in size from the eight-inch cube of a microsat. Bob pointed out that some serious science and intriguing amateur

Continued on page 50

New Products

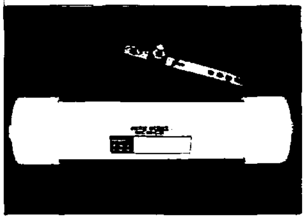


Earbud from MFJ

MFJ's HandyPal™ Earbud Earphone is the perfect companion for your speaker mike and handheld transceiver. It's a super-lightweight foam earpiece that fits comfortably and securely in your ear. You can listen to your radio and still carry on a conversation, or jog, hunt, climb mountains ... whatever!

It's durable enough for years of use, and comes in two models: MFJ-291I for ICOM, Yaesu, Standard, Alinco, ADI, Radio Shack and other compatible transceivers; MFJ-291K for Kenwood and compatible handhelds—and of course they come with MFJ's famous *No Matter What*™ one-year limited warranty—all for $4.95!

To order, or for the name of your nearest dealer, call (800) 647-1800; FAX (601) 323-6551; E-mail [mfj@mfjenterprises.com]; or take a gander at the Web site: [http://www.mfjenterprises.com].



Sorry About Calling the Bomb Squad ...

Well, wasn't that *your* first reaction to the picture? Maybe it's true, what the XYL claims about ham radio affecting the mind ...

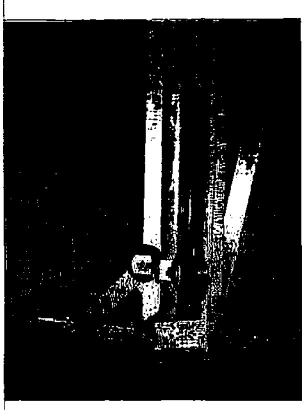
What this is, actually, is the T-4G Line Isolator™ from The Radio Works, and it achieves the maximum possible isolation by providing a direct path to ground for stray RF traveling along the outer shield surface of coaxial feedlines. With the T-4G, stray RF on the coax doesn't see a secondary path to your station equipment because of the extremely high inductive reactance of the Line Isolator's windings. Winding reactance is as much as 50% higher than with previous models.

If a direct earth ground is not available and the copper ground strap isn't necessary, try the T-4, inserted in series with coaxial cable connecting your transmitter to your linear and between your linear and your transmatch. RF in the radio room can cause TVI, RFI, and RF feedback problems—and the installation of line isolators is often the best (or only) solution. The T-4 replaces the 4KRF-LI, the 4KV-LI, and the T-3.

The T-4G is priced at $33.95; the T-4, at $29.95. Order by calling The Radio Works at (800) 280-8327. You can also get a nifty catalog by calling that number, or E-mail your request to Jim W4THU at [jim@radioworks.com]. If all else fails, write to The Radio Works, Box 6159, Portsmouth VA 23703.

He Who Dies with the Most Tools ...

... So start filling in the blank spots in your workshop with the help of Jensen Tools' latest catalog! They're always adding and upgrading, so you'll want the most recent of their great color catalogs. To get yours, call (800) 426-1194; FAX (800) 366-9662; or write to Jensen Tools at: 7815 S. 46th St., Phoenix AZ 85044.



Do You Have a Hazer?

Glen Martin Engineering produces a roller bearing set for Hazers that fit on Rohn and Martin towers. The roller bearing set improves the smooth contact of the Hazer with the tower. The bearings easily roll over tower joints or other rough spots. The bearing system eliminates any previous play or sideways movement on your Hazer.

Suggested retail price for the roller bearing set (HR-2040) for Hazer 2, 3, and 4 is $59.95. For Hazer 5 and 6 (HR-6040), you'll pay $44.00. For more information, contact Glen Martin Engineering, 13620 Old Hwy 40, Boonville MO 65233; call (660) 882-7500; FAX (660) 882-7200. Check the Web site at [http://www.glenmartin.com].

Quick Soldering Anywhere!

The EZ-Torch portable mini torch from Wahl Electronics is powered by a readily available replaceable butane cartridge that will provide 20 minutes of continuous use. You can crank up the flame and get the temperature to 2375° to perform a variety of tasks requiring high heat. The unit has a windproof, weatherproof flame and operates at various angles without extinguishing itself.

The EZ-Torch's small (palm-size), lightweight design makes it ideal for use anywhere, so make sure your tool kit and emergency go-bag include EZ-Torch. It's $21.95 well spent!

Virtual Antennas

NEC4WIN95 is an antenna simulation software running on Windows© 95, 98, and NT. It's an easy-to-use, powerful, affordable tool that will meet the needs of a broad range of amateurs and professionals. NEC4WIN95, from Orion Microsystems in Quebec, is based on Mininec 3©. Wires are entered in a spreadsheet. The software supports copy, paste, taper, rescale and rotation of wires. 2D and 3D views display the current antenna design, with sources, loads, wire dimensions and interconnections. Antenna and pattern are displayed in 3D and rotated freely, using the mouse. Also, with just the mouse, you can recompute patterns at different heights and angles. NEC4WIN95 performs a series of consistency checks and will prompt or warn users when data is missing or badly defined.

Get the full story on the friendliest antenna simulation available today for novice and expert alike by looking up the Web site at: [http://www.cam.org/~mboukri]. A 30-day personal evaluation version can be downloaded from the Web site—so check it out!

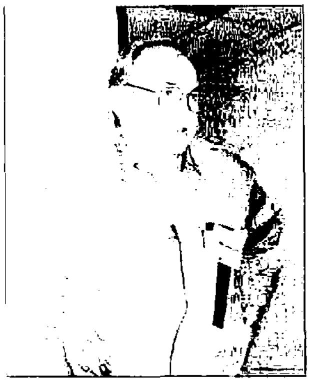


Photo H. Dr. Bob Twiggs KE6QMD presented two papers on satellite programs he has started at Stanford.

Hamsats

continued from page 47

radio payloads can be accommodated even within the diminutive constraints of a nanosat.

An update on the EZ-Sat project was provided by Fred Winter N2XOU and Ken Ernandes N2WWD. The program envisions the design, construction and launch of an entry-level amateur communications satellite, built and controlled by undergraduate students. Those involved with the project believe that it would be a welcome addition to the current hamsat fleet since it would emphasize ground station simplicity. The primary payload is to be a Mode "A" transponder (two meters up and 10 meters down). The design specifies a sensitive two-meter FM receiver that would achieve full quieting with a ground-based transmitter of only five watts EIRP (Effective Isotropic Radiated Power). A typical five-watt HT with a quarter-wave whip would do the job. The downlink would have 2.5 watts output on 10-meter SSB. The program has a long way to go, but the effort has been well received by educators and others intrigued by the EZ-Sat ideas.

Ellen Riddle and others from the Colorado Space Grant College at the University of Colorado at Boulder presented their paper on the Citizen Explorer Mission. The Citizen Explorer 1 (CX-1) satellite project envisions a low-cost small satellite designed to measure atmospheric ozone and UV radiation while circling the Earth. The data would then be transmitted for later study. On the educational side, the objective of the program is to involve students in grades K–12. Technology goals include studies on data communications, satellite autonomy, and fabrication using off-the-shelf components. Scientific pursuits include the investigation of global ozone levels and solar UV levels at the spacecraft. More information can be found on the Internet at [http://citizen-explorer.colorado.edu].

The Friday presentations continued late into the evening after a break for dinner. Keith Baker KB1SF and Steve Bible N7HPR provided introductory hamsat information with their talk, "Getting Started on the Sats—An Amateur Radio Satellite Communications Tutorial." Even for the long-time, advanced satellite chaser, their presentation provided insight and ideas for everyone.

Saturday

Saturday is traditionally the day for the "serious" presentations. This year was an exception. Talks on Friday were excellent and well worth the extra day away from jobs for those who could attend.

Bob Twiggs from Stanford got the Saturday presentations rolling with his slide presentation on SAPPHIRE (Stanford AudioPhonic PHotographic InfraRed Experiment). This is Stanford's first amateur radio satellite. It provides two amateur-related missions, including a digital camera that can be commanded to take pictures and then download them, and a voice synthesizer that can be easily programmed to accept text, phonetically translate the text, and generate an analog audio output equivalent to human speech. Two student-derived missions include a satellite health monitoring beacon and an attitude determination and control subsystem. SAPPHIRE is complete. The Stanford group is working to obtain a launch opportunity.

Dr. Robert Zee from the University of Toronto Institute for Aerospace Studies provided an excellent introduction to the Microvariability and Oscillations of STars (MOST) project. This new program has been selected for funding and support by the Canadian Space Agency's Small Payloads Program to be Canada's first space science micro satellite. The payload mission is to conduct long-duration stellar photometry observations from space of several nearby metal-poor, sub-dwarf stars to possibly allow a lower limit to be set on the age of the Universe.

AMSAT will provide a communications payload for ham use and will work with the Canadian groups to provide educational assistance for the satellite. AMSAT "techies" hope to build a "do-everything" transponder for the ham communications part of the spacecraft. It would use a 1.2 GHz uplink coupled to a 2.4 GHz downlink. It would be capable of everything from high-speed data operation to emulation of a voice repeater.

AMSAT's Vice President of Human Spaceflight Programs, Frank Bauer KA3HDO, could not attend the conference this year. Will Marchant KC6ROL filled in and presented a detailed update on activities associated with the amateur radio presence on the *International Space Station (ISS)*. As reported in an earlier "Hamsats" column, the first equipment is to consist of a transportable system, similar to current SAREX (Space Amateur Radio EXperiment) gear, i.e., an HT-type transceiver, but with a better TNC for packet, and an outside antenna. Upgrades for 1999 include a 70 cm Ericsson handheld and a digitalker module capable of acting as an informative voice beacon. Later enhancements will include

Photo I. AMSAT President Keith Baker KB1SF gave an update on the launch status of Phase 3D.

more bands, modes, and some pallet-mounted gear that will operate autonomously outside the station, but using station power.

The Saturday morning presentations concluded with an enlightening and educational description of the exploits of Ron Ross KE6JAB during his trip to Antarctica. Ron took a 9600-baud digital satellite station to Antarctica. A laptop computer, TNC, two M-Squared "eggbeater" antennas, a 19-Amp-hour Gel-cell battery, and some coaxial cable worked well to provide excellent communications from one of the most remote places on earth. Ron's slides and videotape presentation were quite entertaining and exciting.

Photo J. Bdale Garbee N3EUA showed attendees a prototype of the Japanese SCOPE camera now onboard Phase 3D.

***Photo K.** Bill Tynan W3XO has resigned as president of AMSAT, but remains in the position of Chairman of the Board of Directors.*

Saturday afternoon was dominated by *Phase 3D* presentations and discussions. Dick Jansson WD4FAB gave a very detailed description of the basics of spacecraft thermal design and the requirements of *Phase 3D*. Small, spinning satellites, like the microsats and most other LEO (low Earth orbit) hamsats, are relatively easy to characterize and insulate to keep the electronics and batteries at an optimum temperature. *Phase 3D*, however, is designed to present one side toward the sun. It uses an internal three-axis stabilization system instead of the easier spin-stabilization method. *Phase 3D* uses an array of heat pipes to transfer heat from the hot "sun" side of the satellite to the cold "back" side.

Keith Baker KB1SF brought up the difficult topic of the launch status of *Phase 3D*. Since the cancellation of AMSAT-DL's (Germany) contract with the European Space Agency (ESA) almost a year ago, we have not had a ride to orbit for *Phase 3D*. While ESA had control of the payloads for the first two flights of the *Ariane 5* rocket, Arianespace, the commercial company, takes over for subsequent flights. AMSAT-DL is continuing to work toward a launch on an Ariane vehicle, but is also investigating other ways of getting the hamsat into orbit. *Phase 3D* is a large satellite that was designed for flight on either an *Ariane 4* or *5* rocket. Using a different launch vehicle would require a different adapter ring or system to mate the satellite to the launcher.

A status report on the condition of the hardware and software for *Phase 3D* was given by Lou McFadin W5DID and Stan Wood WA4NFY. A complete description of the many transponders and modes of operation can be found on the Internet at [http://www.amsat.org]. The satellite is complete, and with the exception of some final tests, ready to fly.

The *Phase 3D* talks merged into the AMSAT Annual Meeting hosted by Bill Tynan W3XO and Keith Baker KB1SF. Bill and Keith discussed the financial concerns of the organization due to ongoing *Phase 3D* support. *Phase 3D* has been a large project, and the work is not done until the satellite is in orbit. The launch campaign and its associated costs remain. Following a short break the group moved on to the annual banquet. Joel Harrison W5ZN, ARRL Vice President, was the featured speaker. He was joined by the Russ Tillman K5NRK for introductory remarks and the Mayor of Vicksburg, Robert Major Walker, who welcomed the AMSAT group to the city.

Plaques and awards were presented to AMSAT volunteers, followed by the prize drawings. Over 100 prizes were donated to AMSAT for the symposium banquet. The grand prizes included a Kenwood TM-G707A dual-band mobile transceiver from the Kenwood Corporation, an ICOM IC-T7A HT from ICOM America, a Kansas City Tracker/Tuner package from L.L. Grace Communications Products, a round-trip ticket for two on Southwest Airlines from Bruce Paige KK5DO, and a $200 gift certificate to Ham Radio Outlet from the Vicksburg Chemical Company. For those attending, it was a great evening.

Sunday

Sunday began early with an Area Coordinators' breakfast, chaired by AMSAT Area Coordinator George Caswell K1ME. The AMSAT Area Coordinator volunteers promote AMSAT activities and programs at local ham events and conventions. These individuals are AMSAT's representatives to clubs and ham groups around the country. They are available to answer questions and make presentations. Contact the AMSAT office at (301) 589-6062 to find the one nearest you.

Russ K5NRK and his volunteers from the Vicksburg Amateur Radio Club arranged a tour of the US Army Engineers Waterways Experiment Station (WES) for those who stayed for the AMSAT Sunday events. The group visited the Coastal and Hydraulics Laboratory where working scale models are built to study navigation channels, harbors, and reservoirs. They then make recommendations on dredging, shoaling, groundwater concerns, and salinity problems. The Geotechnical Laboratory at WES, with the world's largest centrifuge, was the highlight of the tour. It is used to recreate field phenomena and environments under laboratory conditions. They then generate data to validate computer models and engineering analyses. You can check out their Internet Web site at [http://www.wes.army.mil/centrifuge].

After the tour of the US Army Engineers' WES facility, the AMSAT board of directors meeting began promptly at 1 p.m. The first order of business involved the agreement AMSAT has been pursuing with the University of Toronto Institute for Aerospace Studies Space Systems Group (UTIAS). The agreement and associated contract represent AMSAT's involvement in the MOST program. AMSAT has agreed to provide educational assistance to UTIAS for the design, construction, integration, and test of the MOST spacecraft. This project is a primary program for the AMSAT organization for the next three years.

***Photo L.** Robin Haighton VE3FRH is closely involved with the new MOST satellite project and has accepted the duties of AMSAT Executive Vice President.*

Bill Tynan W3XO resigned from the post of president of AMSAT after many years of service to the organization. In

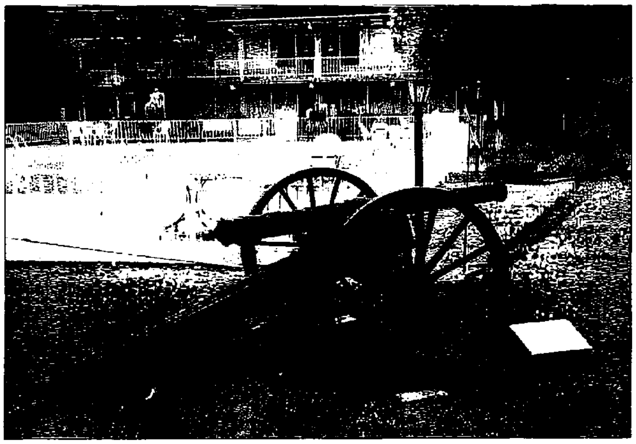


***Photo M.** This Confederate cannon by the pool at the Battlefield Inn in Vicksburg is still aimed northward ...*

Number 52 on your Feedback card

HOMING IN

Radio Direction Finding

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A Banner Year—More to Come

Hams who enjoy the sport of hidden transmitter hunting will remember 1998 as a year of firsts. It started in January, when the ARRL's Board of Directors authorized the appointment of this country's first ARDF Coordinator. This opened the door to the USA officially joining over three dozen other countries of the world in competitions of international-style foxhunting, also called foxtailing, foxteering, radio-orienteering and ARDF. Most of these multi-nation events are organized under the auspices of the International Amateur Radio Union (IARU).

An informal IARU Region 2 (North and South America) ARDF Organizing Task Force had already formed several months earlier. Its members wasted no time building E-mail friendships with other ARDF enthusiasts worldwide. One who offered lots of support was Rik Strobbe ON7YD, Interim Chair of the Region 1 ARDF Working Group. Region 1 (Europe and Africa) is by far the most active of the three IARU regions, with over two dozen European countries having formal ARDF programs.

Rik was excited about the Western Hemisphere becoming much more active in the world of ARDF. Heretofore, the USA's only participation at an IARU ARDF competition had been in 1996, when Kevin Kelly N6QAB went to Australia for the Region 3 Championships. (See "Homing In" for December 1996.) Rik encouraged us to send a team of foxhunters to the 9th ARDF World Championships, to be held in Nyiregyhaza, Hungary, in early September.

I put out the word about this event on the Internet, Amateur Radio Newsline, ARRL Letter and here in *73 Magazine*. When Dale Hunt WB6BYU volunteered to head up the USA's delegation, I knew we were on the road to success. He and other Team USA 1998 members furiously began building RDF sets and transmitters for practice. Informal training sessions were held in the Portland, Oregon, area, as well as the Santa Barbara and Orange County regions of southern California. All sessions were open, so other hams and their families could see and try ARDF adventures for themselves.

The final Team USA 1998 roster:

• Dale Hunt WB6BYU of Yamhill, Oregon, ably handled the team's administrative duties and served as Team Captain. Dale competed at the 1997 Friendship Radiosports Games foxhunt in Japan, where he finished first among all entrants from North America. (See "Homing In" for January 1998.)

• Marvin Johnston KE6HTS of Santa Barbara, California, is an avid transmitter hunter, both mobile and on foot. He says that he got his ham license because of his interest in radio direction finding. He has participated in two formal ARDF competitions in the Los Angeles area, winning first place in his age division at one of them.

• Barbara Johnston KE6OTF is the wife of KE6HTS. She served as observer and photographer during the Championships.

• Jack Loflin KC7CGK of McMinnville, Oregon, is 17 years old and lives close to WB6BYU. He also attended the 1997 Friendship Radiosports Games ARDF competition in Japan, where he won the gold medal in his age division. Jack also tracks aircraft emergency locator transmitters with his local Civil Air Patrol unit.

• Gyuri (George) Nagy HA3PA is a native of Hungary who has won medals in prior ARDF Championships. He was able to compete for the USA because he has resident slien status in this country. Gyuri generously provided additional 80 meter ARDF equipment for use by the USA team during the Championships. This offer was welcome, as our ARDF equipment-building efforts to date have primarily been for two meters.

• Dennis Schwendtner WB6OBB of Santa Barbara is a professional piano tuner who has been on mobile transmitter hunting teams for many years. He would like to compete in the World Championships when and if the IARU rules are changed to accommodate handicapped participants. (He is blind.) Meanwhile, Dennis has competed at ARDF events in the Los Angeles area with the assistance of an extender. He was USA's Team Trainer for the Championships.

The triumphant return

"This was a great ham event!" wrote WB6BYU just after his return from the Championships in Hungary. "The people were quite friendly and glad to finally have representatives from Region 2. We got a lot of advice on equipment and strategy from members of the other teams. For instance, I sat up late in the night with Tchermen Gouliev UA3BL, who was helping me repair and realign my 80m receiver. He went out the next day and won the Gold. And my receiver worked well enough for me.

"There were almost 250 competitors from 32 countries," Dale continued. "Terrain was pretty flat and sandy, mostly wood lots with an occasional cornfield or pasture. Course lengths were around 5 miles. The two meter competition was fairly straightforward, as the transmitters were in somewhat

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addition to his long tenure as president. Bill was a part of the creation of AMSAT in 1969. Bill will continue his involvement as chairman of the board of directors. AMSAT Executive Vice President Keith Baker KB1SF agreed to take over as President of AMSAT, while Robin Haighton VE3FRH has stepped in to fill the Executive VP slot.

In addition to the beginning of the MOST project, AMSAT is working diligently to find a ride to space for *Phase 3D*. This is the focal point of AMSAT's current efforts. In October 1998, the satellite was sent to Maryland for thermal-vacuum testing. Shake testing is scheduled for January 1999, and final documentation and laboratory close-out are scheduled for February 1999. The completed satellite should be boxed up and ready to move by the end of February. *Phase 3D* will then be stored in the Orlando area to wait for a launch opportunity.

The 1999 AMSAT General Meeting and Space Symposium will be held in San Diego, California. The Vicksburg event will be hard to beat, but the volunteers from southern California are confident that they can match the quality of the 1998 effort. Many exciting satellite projects are nearing launch or just getting started. Don't miss it!

of a giant circle. On the eighty meter course, they were in more of a diamond with the start and finish at opposite corners, making it a more difficult decision to choose the optimum order to find them. Fastest times were around 45 to 50 minutes, and the time limit was 130 minutes. For a relatively inexperienced team (except for Gyuri), we did relatively well. Nobody was disqualified or came in last in their age division, though the latter was a real squeaker on the 80m hunt!"

Team USA 1998 members were some of the most experienced ARDF enthusiasts in the United States, but they were pitted against the best in the world. Although their running abilities did not place them among the medal winners, it is important to note that they found all but one of their 34 aggregate hidden fox transmitters. Each USA competitor got to the finish line within the allotted time, to avoid disqualification.

Winners of the overall medal count were the Russians with seven gold, seven silver, and two bronze. Ukraine also had 16 medals, but only four were gold. The Czech Republic, Hungary, Germany and Belarus followed with 13, seven, three, and two respectively. Lithuania and Romania each got one medal.

Team USA 1998's trip was a great success because our delegates created a visible presence for our country in this international sport. They generated publicity and interest in ARDF and fostered international goodwill among competing societies. They also gained intimate knowledge of the mechanics of international ARDF competitions, which will prove useful in putting on future Region 2 events. To top it off, they made lasting personal contacts with ARDFers from other countries, which will help develop the sport here in IARU Region 2.

1999 will be even better

Later that month, another ARDF first occurred. The IARU Region 2 Plenary Conference in Venezuela approved a request by the Friendship Amateur Radio Society (FARS) to include IARU Region 2 ARDF Championship foxhunts as part of its 1999 Friendship Radiosport Games (FRG-99). FARS and the Friendship Games have played a major role in developing ARDF in the USA. Stories of previous Friendship Games have been in "Homing In" for September 1991, October 1993, December 1996, and January 1998. Dale Hunt WB6BYU, team leader for the Hungary trip, will be responsible for putting on the FRG-99 foxhunts.

Now is the time to start planning for FRG-99, to be held August 10–14 in Portland, Oregon. All ITU Region 2 nations, through their IARU Member Societies, are invited to send teams for this historic event. Individual entrants from Region 1 and Region 3 countries may compete in the traditional Friendship Division. To encourage more Region 2 participation, individual entrants from Region 2 countries that are not sending teams will also be accepted. Medals will be awarded to individual contestants and to national teams for qualifying finishes in several age/gender divisions. VHF (two meter) and HF (80 meter) ARDF competitions will be held on separate days.

In order to properly plan for expected attendance, FARS-USA is requesting that any IARU Region 2 society interested in sending a team provide a Letter of Intent to Participate as soon as possible. The deadline for return of Letter of Intent Forms is January 10, 1999, but later applications may be considered if space remains available.

FRG-99 is sure to be a time of fun, camaraderie and international goodwill, especially for on-foot foxhunting enthusiasts. It could bring ARDF enthusiasts from many North, Central and South American countries as well as FARS member delegations from USA, Canada, Japan, and Russia. Mark your calendar and watch for more announcements. Further information about this event is available on the FARS USA World Wide Web Site. There you will find the full official announcement, schedule of events and dates, and Letter of Intent forms. You can get there by a link from the "Homing In" site.

If the games in Portland don't provide enough ARDF thrills for 1999, you could also compete in Asia. The IARU Region 3 Championships will take place at Konyang University in Nonsan, Korea, about 90 miles south of Seoul. It's about a three-hour ride by bus or train from the Seoul airport to the Championship venue. The events run from 21 to 26 June 1999. National teams from outside Region 3 are not invited to the Korean event, but individuals from these countries may to compete in the Friendship Division. For more information, contact me or visit the "Homing In" Web site.

And furthermore ...

Challenging transmitter hunts are a tradition at the Southwestern Division convention of the ARRL. The 1998 convention in San Diego was no exception. Doc O'Connor K6DOC of Ramona, California was T-hunt Chair this time. He enjoyed the 3-transmitter mobile hunt at the 1997 get-together in Riverside so much that his own hunt was in the same style. His three fox boxes were set out within a 1135 square mile area of San Diego County that included the San Diego metro area, a 6500-foot mountain peak and some desert terrain, too. Starting from Montgomery Field, hunters had four hours to pick up the tags at each transmitter and get back to that airport. Anyone arriving late would be ineligible for prizes provided by the convention organizers.

There were about two dozen signups at the T-hunt table at Convention Headquarters on Saturday, but only 14 vehicles took off from the starting point on Sunday. Apparently many teams combined, as some cars were fully loaded at the start with a driver, beam turner, navigator, timer, etc. That's a good strategy on a hunt in which time is the only criterion for winning. More minds and hands should lead to better results.

The shortest route to all three Ts and back was about 100 miles. Of course there was a "home court advantage" for

Photo A. Dapper Doc O'Connor K6DOC gives instructions to the hunters as he starts the ARRL Southwestern Division Convention's mobile T-hunt.

Photo B. Bob Legg W6QYY has his dual-antenna TDOA set ready for "sniffing" duty at the Montgomery Field starting point near San Diego.

Number 54 on your Feedback card

The Digital Port

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This month—SSTV, APRS, and packet adventures

You can just about pick your favorite digital topic this month and I may have something for you. It is a lot of fun experimenting with different ideas.

For openers, I was putting together SSTV on the laptop using Pasokon and a serial modem. This is working out well. Bob W6EUZ and I regularly trade a few images on 40 meters. We are doing this with less than 100 watts, in the daytime, about 7.190 at 12:30 local. I was having a problem with received images filling with hash from the sporadic noise, and thus began a small project.

There isn't much choice of filter systems when running SSTV on this laptop. ChromaPIX gets the hiccups and there is no plug-in board to gain DSP. But there is a solution. I was looking at the Timewave DSP-599zx and thinking how nice it would be if I could run the SSTV signal through its built-in modem. I gave it a quick try, but I think they have a different configuration at the serial port that only works with their excellent DSP-RTTY software.

Wanting to do something simple (here we go), I decided to make a breakout box to run the received audio SSTV signal through the DSP-599zx before it got to the modem. After a quick look around for jacks and a box, I decided the parts supply was exhausted and headed to the local Radio Shack™ store.

I am using telephone flat cable. One of the downsides to that is the cost of jacks. Looking over the available assortment of telephone goodies, I found a small baseboard-style double outlet which is big enough to allow the installation of two phono jacks. With jacks, the little box, and a made-up flat pigtail (I was even out of those), the total tab set me back about $11. Not bad, so far.

This was going to be a snap. The phono jacks mounted easily in quarter-inch holes. Then it was time to think. When you look at the color codes on the made-up flat wire, you realize that the colors are reversed from one end to the other. I could see a problem arising. After checking to be sure I was routing the proper audio and ground wires to the DSP unit, I reversed the wiring, colorwise, between the two factory-wired sockets within the RS box.

This little work of art kept me occupied through seemingly countless disturbances, but after about four hours, including numerous restarts, I plugged it in and it worked like a champ. The SSTV choice on the DSP-599zx says *fixed filter*. That means there is no tweaking, which is good for me—one less set of decisions to make.

I understand some other DSP units on the market cause problems with SSTV, but this one is superb. There is a bypass toggle so you can observe the effects of the filtering. When the bypass is pressed, either to take the filter out or put it back in, a noise line is inserted in the image. I won't say that is good, but it gives a definite boundary to compare the filtered to the non-filtered signal.

More on SSTV to get you started

As you frequent readers are aware, I have been dabbling in SSTV from time to time. There are several low-cost packages available to those who wish to join in the dabble process. Check **Table 1** for ChromaPIX and Pasokon. Both have sampler downloads that will get you into SSTV for a trial run in the 15- to 30-dollar bracket.

The programs are well done and you can use them forever (they aren't cripples and they don't go up in smoke at 30 days), but you will find reason to upgrade, which, inevitably, costs. That is part of participating in a great hobby. Some folks spend their money skiing and some go hunting: I know people who could have a great ham shack for the price spent skiing or hunting each year.

The only crippling factor with the ChromaPIX is that the program will only run for 30 minutes at a stretch until you register it. That isn't too bad. Some hams may find they will run the program 20 or 30 times before breaking down and sending the $120 to avoid telling their friends why there is a delay in the next transmission.

One of the neat features of ChromaPIX is that it utilizes the sound card in your PC. The program runs in Windows and you do need a fairly up to date computer. If your computer fits the parameters of a quality sound card, enough RAM, and a fast processor, the program not only works but also affords DSP for excellent reception.

The only hardware you need deal with is assembling a few cables between your sound card and your radio. One other thing: You will want to eventually assemble a PTT interface that is described on their Web site. Lacking the PTT capability, you will do some manual switching to transmit and receive. Not too difficult to master to see this work in your own shack.

The Pasokon system has an entry level EasySSTV which is a freebie piece of software. Another small catch: You must build a simple serial modem before you can use it. The cost of building the simple modem, in most cases, is less than $20. The program runs in DOS and does not require a superfast modern PC.

With the introductory level Pasokon program, you will lack the filtering to receive images

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teams of San Diego County residents experienced at hunting on those roads and terrain. Not surprisingly, the first three places and fifth place were taken by local teams.

Only ten vehicles returned in time, five with three tags and five with only two. The best time was a little under three hours.

The "Homing In" feature on tracking burrowing owls brought excellent response from readers of *73 Magazine*. As you read this, the fall southward migration of the owls from Saskatchewan and Alberta is over. They are in their winter homes, thought to be scattered throughout southern Texas and New Mexico, and perhaps in nearby northern Mexico. More hams and monitoring enthusiasts are needed in these areas right now, as there are still tagged owls that are unaccounted for. For more information on this project, go to the "Homing In" Web site. If you don't surf the Web, send me a self-addressed stamped envelope for information by return mail.

Other wildlife tracking projects are in the works. Over 50 hams around the country have signed up to participate, and more are needed. To join, send E-mail or postal mail with your location and a description of your equipment and suitable RDF sets, if available. Tag transmitters are in the 150 to 174 MHz range.

when the signals become marginal. For example, a transmission of a typical image takes well over a minute, and a simple dip in signal strength can leave a blurred distortion across the image for the duration of the dip into the noise level.

Pasokon makes available state-of-the-art DOS software and a board to install in your PC to make SSTV a real pleasure to operate. To get the high-end performance, you will need to spend about $200. This can make sense when compared to upgrading your computer for the sole purpose of running SSTV if you are satisfied with the computer otherwise.

All the information you need to help make these decisions and get started can be found on the Web sites in **Table 1**. There is quite a bit of activity on 14.230 and 14.233. You can recognize the signals due to their unique warbling sound that changes as the different parts of the images are scanned.

Of interest to those who would like to get their feet wet on a "local" basis here in the west, I have been getting on 7.190 as many early afternoons as possible. The advertised 7.171 appears to have too much interference at this end of the country and the 7.190 lends itself well. There have been no complaints about it being a reserved frequency for a net or emergency service, so come and visit. Break in if it is busy. If it is not busy, I may just be monitoring. If I am there, I will transmit an occasional SSTV CQ image.

One of the hot topics nowadays with packet is the Automatic Position Reporting System (APRS). I kept running across packet signals from regular repeater frequencies as I traveled and couldn't get anyone to explain them. The signals were obviously APRS packets because I could copy the format with my regular packet program but the information didn't make sense.

So I went to the source to learn about this secret. I first bought a copy of *Getting On Track With APRS* by Stan Horzepa WA1LOU. This is good information. However, the way technology develops, it is quickly becoming out of date. A real source of info can be found at the Tucson Amateur Packet Radio (TAPR) Web page (see **Table 1**). There you'll find a wealth of information concerning theory, operation, and how-to, and you can download shareware for Windows, Mac, and DOS to get going.

I found much of the posted information was also getting the antique flavor, so I subscribed to the APRS SIG newsgroup from the same address. This has to be the busiest ham newsgroup I have ever seen. There are a minimum of 25 postings each day. The good part is that the right people are posting messages and they are serious about APRS. After about two weeks, it appeared I had my questions answered either directly or by simply "lurking" and reading messages. It was time to "unsubscribe" and get some serious work done.

I attempted to get going with the PK 232MBX. I was assured that others were using them, but there is a problem in that they revert back to other modes when turned off and the Windows APRS program won't bring the 232 up in packet mode if it happens to have gone to rest in Baudot unless you tweak the initialization in the APRS program.

I didn't want to confuse the startup parameters in the 232, so I went to the MFJ 1274. It is a little simpler (not so sophisticated) and cooperates for this purpose.

As I have mentioned before, this home QTH is a little remote and there is a disadvantage when working with a system that requires input from line-of-sight transmissions. APRS appears to be in working order. The test will be to observe what it does when I take it to the big city in a week or so. More to report after that.

Some interesting things still happen with *normal* packet radio. I received word a few months back from Jeff KF4KGQ, who is a BayPac BP-2M user, that he was building one of the kits from LDG Electronics to give to his brother when he got his ham ticket. Recently, Jeff sent me a

Current Web Addresses

Source for:	Web address (URL)
HF serial modem plans + software	http://www.accessone.com/~tmayhan/index.htm
PCFlexnet communications free programs	http://d10td.afthd.th-darmstadt.de/~flexnet/index.html
Tom Sailer's info on PCFlexnet	http://www.ife.ee.ethz.ch/~sailer/pcf/
SV2AGW free Win95 programs	http://www.forthnet.gr/sv2agw/
BayCom – German site	http://www.baycom.de/
Pasokon SSTV programs & hardware	http://www.ultranet.com/~sstv/lite.html
Winpack shareware for Windows	http://www.duckles.demon.co.uk/ham/wp.htm
Baycom 1.5 and Manual.zip in English	http://www.cs.wvu.edu/~acm/gopher/Software/baycom/
Source for BayPac BP-2M	http://www.tigertronics.com/
Tucson Amateur Packet Radio—where packet started—new modes on the way	http://www.tapr.org
TNC to radio wiring help	http://prairie.lakes.com/~medcalf/ztx/wire/
ChromaPIX & W95SSTV	http://www.siliconpixels.com/
Timewave DSP & former AEA prod	http://www.timewave.com
VHF packet serial modem kit	http://www.ldgelectronics.com

Table 1. Current Web addresses. If you encounter a problem with a European address, the network is often at fault. Try again later.

NEVER SAY DIE

continued from page 6

Art Bell show, that group alone could start the dominoes falling.

Well, we'll see how it shakes out.

No, I don't sit up all night listening to Art Bell. As I've said, I tape it with a VCR and listen while I'm fixing and eating meals, and while I'm doing mindless stuff like collating the pages of my books. The most interesting parts of Art's show are during the second hour, and half of that can be fast-forwarded through the news and commercials. This is the hour when Art starts interviewing his guests.

Millionaires

Don't you wish you could retire with at least a million dollars salted away? The fact is, if we could straighten out our government, virtually everyone could retire as millionaires.

I've just read a very interesting book that explains just how this could be accomplished. It's *A Nation of Millionaires*, by Genetski, published by The Heartland Institute, 800 E. Northwest Hwy. #1080, Palatine IL 60067; (847) 202-3060; 168p, 1997, paperback; ISBN 0-9632027-4-X.

First, the book shows that the net family income (without the wife working) has dropped about 16% in the last 25 years. It explains the Social Security disaster ahead, which Congress can't force itself to face. Then it proposes solutions. That retirement with a million dollars isn't a rosy scenario, it's a worst case deal, where some guy is only making the minimum wage. So how do they manage this miracle?

First the book tackles Social Security. Here it cites the change that Chile made in their system, which has been so amazingly successful that one country after another has been changing to their system. Our Social Security system has unfunded benefits of $11 trillion, which Congress has conveniently taken off the budget so we don't see it. By privatizing Social Security the lowest-paid worker would, at age 67, have $380,952 in his account.

Next, by allowing workers to set up medical savings accounts, our worker would, at 67, have an additional $475,000 saved up. That comes to $856,716 total.

Next, the privatizing of education via school vouchers would cut school costs (taxes) enough to provide our retiree with an additional $25,947. Eliminating government regulations which cost the economy $600 billion a year would add another $34,000 to our suffering wage earner's retirement package. If the government got the heck out of the wasteful environmental business that would add another $35,000 to the lowest-paid worker's retirement bundle. By limiting frivolous law suits and excessive punitive damages, legal reform would add another $37,000 to the pile. That brings our suffering worker into retirement at 67 with about $1 million. The average wage earner would end up a multimillionaire.

The book goes over the math in depth and explains each change needed, and why vested interests will make it difficult to make the changes. We have to decide whether we want the entrenched interests to continue to run our government, or us. I suspect that even the prospect of several million dollars at retirement isn't enough to get most people to take any interest in changing things, or even bothering to vote at all. Few people worry enough about the future to spend any time or effort on it. If they did they wouldn't be eating the garbage they're eating and downing endless known poisons. It takes years for cigarettes to kill you, so why worry now? And yes, I know Social Security is a tax scam, but what can one person do? Where did I put the TV remote?

Starr Nonsense

Those endless negative stories about Judge Kenneth Starr originated from the White House *spinmeisters* and none are true. The White House spinners have been at work steadily from the first Whitewater investigations attacking Judge Starr. The sad part is that our journalists and the public have bought this smear. There are so few people left who seem to be able to think, that I despair. Yes, I know, our school system was imported from Prussia for the specific purpose of keeping people from thinking, and it has been a resounding success from that viewpoint. That's about its *only* success.

Every target of the Starr investigation has routinely been smeared by the White House spinners. And I'll bet you've been suckered into believing their version. How could we have elected such a sleazy president? Shame on us.

Wetbacks

Yes, America has millions of acres of unused land. Of course, most of it is owned by the government, and little of it is of any real interest for human habitation.

So what? Well, we have this controversy about immigration. Should we seriously limit immigration or should we maintain our loose borders which bring in millions of illegal immigrants every year?

Oh, I can understand how our country would benefit from allowing highly educated or skilled workers to move here, but that isn't what we're getting most of the time.

The open borders believers point to all of our undeveloped land. What they don't point to is our more and more crowded cities, which is where most immigrants head. That's where the jobs are, not out in the desert or remote mountain areas. If you've visited a city lately you've seen the jammed highways. California's freeways turn into gigantic parking lots at drive time, as do the highways around every major city. I've been in the traffic jams that surround New York City, Chicago, Denver, Dallas, and so on.

Are we going to just build more and bigger roads and watch while our cities gradually creep toward each other? In the northeast, Boston, New York, Philadelphia, and Washington have just about connected. They call it a megalopolis. Just what we need is to double the population of this area, which is what's happened within my lifetime.

Without immigrants our population has stabilized and is not growing much. So, if you really want to let in anyone who wants to come, be prepared to pay the price. The immigrants sure aren't going to pay it. And the price is stiff, with the need to virtually rebuild our city infrastructures to accommodate everyone.

Our subways are already jammed solid. Are we going to build more tracks and stations? That means digging up our streets for years, plus spending billions of dollars.

More cars and buses mean more pollution and smog. That what you want?

We have the laws limiting immigration; we're just not bothering to enforce them.

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note that the project was up and running.

The exciting part of the message was that he is the star on the opening page of the TigerTronics Web page. (See **Table 1**.) Jeff has done some remarkable things with his miniature packet station, making contact with the orbiting space station *MIR*, and there is a good write-up on his adventures there. I hope that at the time this is published the picture and story will still be there. Web sites do change.

If you have questions or comments about this column, E-mail me at [jheller@sierra.net] and/or CompuServe [72130,1352]. I will gladly share what I know or find a resource for you. For now, 73, Jack KB7NO.

Every now and then I'm forced to drive on a jammed highway and I wonder at the patience of people who have to commute to and from work every day under those conditions. That's a terrible waste of time and a lousy way to live. It's even reached New Hampshire, where the interstate highway going into Massachusetts is absolutely terrible at morning and afternoon drive times.

The fact is that there are very few jobs for unskilled or uneducated workers outside of the cities, so that's where immigrants are forced to go — and forced to live under awful conditions. But that's still better than where they came from. At least here, in a generation or two, their children will be part of the middle class. They'll be Americans.

God or the Devil?

A really weird thing happened to me. I like to be a guest on radio talk shows so I can get more people interested in (a) regaining their health, (b) making more money, and (c) giving amateur radio a try. I have a long list of things I can talk about that I send to the talk show hosts. One of them has to do with the predictions of soon-to-come catastrophes which will supposedly wipe out most of mankind.

The other day on an upstate New York station I was explaining what various people (Gordon Michael Scallion K1BWC, Ed Dames, and Sean David Morton) have been predicting in the way of killer solar flares, a pole shift, a new ice age, and so on. The host cut me off and asked where these people were getting their information from. I said from remote viewing and meditation. He then asked whether these predictions were from God or the Devil. He explained that he is a devout Catholic and that any such predictions would have to come either from God or the Devil.

Hmm. I explained that I couldn't care less where people were getting their information. Their credibility with me had nothing to do with their sources, it lay entirely in the accuracy of their predictions. If they've a good solid record of past hits, I'm going to pay attention. I further explained that it has been scientifically proven that we can predict the future.

He cut me off, saying that this all sounded like the work of the Devil to him.

Sigh.

Belief

My dictionary defines belief as acceptance of the truth or the actuality of anything without certain proof. Hmm. So if you ask me if I believe that NASA faked all of the Moon landings, the answer is no. Having gone to some lengths to examine all of the evidence, I must say that it sure tends to lead one to that conclusion as being the only realistic one.

One night on the Art Bell show I was asked by a listener if I believed in God. I dodged the question by saying that there is considerable evidence supporting the concept. Well, that was better than getting into an argument with someone who is a believer and ready to quote scripture. Am I an atheist? That's someone who disbelieves in God. No, I don't disbelieve, there not being enough evidence to support such a belief. My approach to life is the scientific one of investigating things with an open mind, not with the end of proving or disproving anything. I try to let the evidence speak for itself and look at as much evidence as I can find.

Any discussion of God is a minefield, because of the strongly held beliefs. It isn't something that many people are even able to think about.

In God We Trust

I notice that Art Bell quickly cuts off any callers who start quoting the Bible. When I was a youngster my folks sent me to Sunday School at the local Dutch Reformed Church. At four and five years old the stories were no more real to me than the Oz stories. This continued off and on into my teens. I have no recollection of what I was "taught" at the time; the only thing I remember is that one Sunday when I was 14 some guy brought in a box of old radio parts and gave them to my best friend, Alfie. He took one look and gave the box to me. And that got me started on a lifetime in electronics.

It was at this same time that I auditioned for the St. Paul's Church choir, where I sang until my voice changed. That was one of the biggest churches in Brooklyn and we not only got paid to sing, but we had a free month of choir camp out on Long Island every summer.

For some reason all this churchgoing didn't "take" as far as giving me religious convictions. The singing was fun and the sermons we sat through were really boring.

Oh, I've read parts of the Bible now and then, but its 17th-century English was difficult to deal with.

I did business once with a born-again Christian who had been saved by Jesus. He took me for several million dollars.

Once I'd read the stories about how the major religions were started, I'm afraid I lost respect for them, at least as far as providing me with any guidance. But, being a pragmatist, I've kept my mind open about God. The more I've

read about what we call the next world, either as reported back by the deceased, by communications with psychics, or via near-death experiences, the more I've heard about there being a God, but not one anything like the one being worshipped by Christians, Moslems, and so on.

Frankly, Christianity has worried me. Its believers have sanctioned endless killing, such as we've been seeing in Northern Ireland, which is warfare between two Christian sects. And both are convinced that God is on their side. I won't even get into the Inquisition or the abortion clinic killings. Or abortions.

Which brings me to an interesting book I've just read. It's *In God We Trust*. The Holy Bible, the "Good Book," is held by Christian fundamentalists as being the revealed word of God. Every word in it, they believe, is true. After reading what's really in the Bible, I doubt seriously that the fundamentalists who believe in the book could have actually read it. Good grief, wait'll you read about the endless carnage that God has sanctioned, including mass murder, rape, and even abortion. That's right, abortion. See Hosea 13:16, where God orders fetuses to be ripped from their mothers.

If you are a devout Christian this is not a book you want to read. It cites chapter and verse of what the Bible says, letting God speak for Himself. I'm sure you're aware that the Pontiff in the Vatican, who professes to be the Catholic Church's direct connection to God, and who was well aware at the time of Hitler's extermination of millions of Jews, said nothing against what was going on.

God's biggest coup was the drowning of everyone and every beast, every tree, every insect, everything alive on Earth except for Noah and his group during the flood. Try to imagine the work it must have taken to feed that large an assortment, including elephants, for all that time — not to mention in the aftermath of the flood when it must have taken centuries for the trees and grasses to regrow as food. And who cleaned out the massive amounts of dung that had to be dealt with? And how did Noah keep all the animals from continuing the usual food chain system, where there was just one pair of each kind of animal or fish?

A true believer in the Bible wouldn't want to know about the histories of this same period recorded in other lands which don't mention the flood which the Bible says covered the entire Earth to a depth of almost five miles.

Say, where did Noah get kangaroos, penguins, and polar bears in the Palestine area for his ark? And eucalyptus leaves to feed those pesky koala bears?

People all though history (and way before history) used gods to explain the things they didn't understand. We're still at it, though most religions have settled on one God instead of a bunch to explain what are still mysteries to us. Science has helped to explain a lot, though our religious leaders have done their best to kill these meddlers. But science has been stopped by the mysteries of consciousness, which is forbidden territory. Both scientists and religious leaders are very nervous about the way science has been going recently, with the development of quantum and chaos theories. And then the recent scientific validation of psychokinesis, clairvoyance, precognition and such has driven many scientists into severe denial.

You can get a copy of the book from VERVE, Box 750, Madison WI 53701 for $12 ppd. But if you want to continue to believe in God, Satan, and so on, you'd better pass this up. Ignorance will probably keep you happier.

Even More Poisons!

Despite intense pressure from the food giant lobbyists on Congress and the media, the EPA plans to start this year to screen all chemicals found in food and drinking water for endocrine disrupters. They're going to sort through the 87,000 chemicals which are in common use, narrowing them down to around 15,000 which are suspected as being the most likely to disrupt the endocrine system.

By the end of 1999 the agency plans to test all 15,000 — at a cost to the manufacturers of about $200,000 per chemical — to see which are the most likely to interfere with hormones. That's a $3 billion bill the EPA will be handing to the food industry.

The worst suspects will then be tested on lab animals, with those tests running a projected $2 million each.

In the meanwhile you, the unsuspecting public, are in all probability going to continue to buy packaged food products which contain these 87,000 marvels of chemistry, most of which have never been tested for long-term effects on us. On the bright side, these chemicals do keep food from spoiling, often for decades. This is the stuff you have been eating. This is the stuff you've been feeding your family.

Scientists are worried, and with good reason, that many of these chemicals may be doing us irreparable harm, complete with genetic changes which will affect our kids and their kids.

With girls reaching puberty earlier and earlier, with birth defects escalating, with breast and testicular cancer soaring, with low sperm counts being reported everywhere, scientists are finally starting to zero in on poisons which are in our food, water, and air. We know the plastics in our cars are coating the windshields with a film, but what are these chemicals doing to us as we breathe them? No one knows yet. We put out food in plastic containers — we buy it in plastic containers — yet we don't know whether or how much the plastic may be getting into our bodies or what mischief it may be doing.

Prudent people no longer are cooking in aluminum pots and pans. Nor iron, either. For years it never occurred to people that these could poison them. How much of what metals are you getting with your Coke, Pepsi, or beer?

I've written recently about the aluminum in most deodorants and the awful stuff in pesticides and bug sprays — stuff that can be absorbed through the skin.

If you stick totally to raw food and keep it in glass containers, you're going to be fairly safe. Oh, yes, wash most of your food off well with water to remove pesticides and with silver colloid to get rid of *E. Coli*, *salmonella*, and other passengers.

Or you can carry on as you have and wait to see what those 87,000 chemicals are going to do to you and your family.

Check out the article on the subject in the 9/14/98 *Business Week*, page 105.

More Poisons

My thanks go out to Swede WDØAXP of Reno, Nevada, for a clipping from *Popular Mechanics* about the behavioral effects caused by some metal toxins. It cited the Huberty killing spree in 1984, where he killed 21 people in a restaurant. They found that, "He had the highest cadmium level we had ever seen in a human being." They've found the same problem in testing other mass murderers. The metal goes to the brain and disrupts the brain's inhibitions. Metal toxins such as cadmium, lead and manganese have been found to be contributing to children's behavior problems. Indeed, the presence of these metals in the environment has been statistically shown to significantly increase the crime rate in those areas.

A recent *Dateline* program featured the rebellious behavior of a young child. A doctor "solved" the problem by having them let the kid eat what he wanted when he wanted, go to bed when he wanted, watch whatever TV he wanted when he wanted, and so on. The family, or the doctors

they consulted, would have done well to have a copy of my $5 review of books you're crazy if you don't read. One of the books I highly recommend is *The Impossible Child* by Dr. Doris Rapp. $13.50 (ppd.) well spent.

Dr. Rapp exposes how the foods kids eat and things in the air they breathe can affect not only kids, but older people as well. Children called lazy, dumb, nasty, rude, hyperactive, irritable, with attention deficit disorder (ADD), etc., may be reacting to chemical sensitivities. A simple test for allergies is described in *The Pulse Test*, which is also reviewed in my guide.

As I watched the *Dateline* program I was yelling at my TV set to, for heaven's sake, find out what the kid is allergic to and stop feeding it to him. After reading *Lick The Sugar Habit* (yes, of course it's reviewed in my guide), I'll bet that just cutting sugar out of the kid's diet would make for a miracle in behavior improvement.

Unfortunately for those of us (and that's almost everyone) who have been taught to believe in doctors and depend on them, many (most?) doctors seem to stop their medical education at the moment they get their license to kill. If something wasn't taught in medical school, they don't know much about it. Like health, for instance.

Are you and your family still drinking tap water? Are you living downwind of a smokestack belching toxic metals?

Knowiug Better

On my dad's birthday I got to thinking, if he'd only known better he'd be celebrating his 101st birthday today and going out fishing before the birthday party. "If I'd only known better" is something we tell ourselves now and then. If my dad had known better he wouldn't have smoked for 40 years, and drunk all that time too. He'd also have eaten an entirely different diet. The amazing thing is that he still managed to live 87 years, though the last 10 were spent with an oxygen bottle or generator nearby. Emphysema.

I'd be in a lot better shape if I'd "known better." But where do you get dependable information so you can "know better"? I've read hundreds of books on health, nutrition, and illness — plus health newsletters and endless junk mail/health product brochures. They all have one thing in common: None of them tells the *whole* story of how to be healthy.

My dad smoked and drank. Both of my grandfathers did the same, and their fathers before them a hundred years ago. But I was lucky. For some reason I've never been driven by peer pressure, so when I tried smoking and found it stank, I stopped. I tried drinking and didn't like that effect either. I stopped. Unfortunately, eating foods that are destructive to the body is very pleasurable and doesn't take a lot of getting used to, so I've eaten my share of doughnuts, pies, cakes, candy, and so on. I never got much into coffee or Cokes, so I was spared those addictions. I tried 'em and didn't like 'em much.

Hospitals Again

A report in the Journal of the American Medical Association (JAMA) by Drs. Pomerantz, Lazarus, and Corey said that one in 15 hospital patients has serious reactions to prescribed drugs. 5% of them die! About a quarter of them are allergy-related. In 1994 2.2 million hospital patients were affected and 137,000 died. I think that's what they call an acceptable loss. Remember what a fuss we made over 58,000 Americans getting killed in Viet Nam, and that was over a period of years! Hospitals are very dangerous places to go.

Schools

The cost of running our schools has been escalating at over double the inflation rate, much like our so-called health care costs. Meanwhile, as you know, the quality of education has been going down even faster than the costs have been rising. Well, holy moly, Batman, what can we do about this?

Unfortunately the situation is in the hands of our beloved politicians you keep reelecting, so it's going downhill from hopeless to whatever the next step in disasters is.

I've written a good deal about this before, with my efforts apparently going in one eye and out the other. Maybe it's a form of Alzheimer's caused by being too

close to an HT or something.

There are several basic problems with our public school system. One is the abysmal quality of the teachers our teachers' colleges are graduating, with their jobs protected by the enormously powerful teachers' unions. But perhaps even worse is that the whole fundamental school system was adopted as a way to take kids with a wide assortment of intelligences and temperaments and turn them into as identical a product as possible. Then there's the enormous bureaucratic overhead that's built up — which we euphemistically call administrators.

There are some private schools which have done away almost 100% with administrators, with no detectable downside.

One more obstacle to education is the many local oars in the water by local school board members. These, for the most part, assholes don't know diddly-squat about education, so they're busy arguing about how many desks to a classroom.

I'm not going to plunge into a book on the subject. Yet. But how about using the Japanese system of having the students do most of the routine maintenance? Like emptying the waste baskets, keeping the halls and walls clean? That would end all that graffiti crapola in a hurry.

Look, every kid is different. Different IQs. Different interests. Different goals. Different families. Different upbringing. If teachers offered classes as an option instead of making them mandatory they'd have to justify the time and work involved to their potential customers. Good teachers would get crowds and the lousy ones would retire to the teachers' lounge and watch Jerry Springer or the soaps. From what I know now, some 60 years later, they never would have put me through the torture of trigonometry or calculus. They could have made a good case for algebra, which I enjoyed at the time.

Many private schools have proven that they are able to turn out far better educated graduates than the public schools, and at half or less the cost. That's right, 50% of our school budget is wasted! And that's big bucks out of your pocket. And, if you're an employer, you'll suffer *again* when you hire these public school graduates and try to get them to do some useful work, or to do anything beyond the absolute minimum to get a paycheck.

Our colleges, both public and private, are no better. They just cost more.

I've proposed an inexpensive way that every public school could be provided with just about any kind of workshop needed to help teach manual skills. I've also proposed a way for kids to be taught by some of the best teachers in the country — teachers who could make their subjects fascinating and exciting to the kids and would have the kids fighting to take their courses.

If we could get kids interested in what they were learning there would be no need for any homework assignments. The kids would read books at home because they were interested enough to do it. I've been reading in every spare moment for decades — because I enjoy it so much. And, every now and then I come across a book that's so incredible that I just *have* to share it with as many people as I can, so I review it in my editorial and then add a review of it to the next edition of my *Secret Guide to Wisdom*. Parents could do a lot worse than arm their kids with my *Guide*. On the other hand, this could upset everything, because I preach that everyone should think for themselves instead of accepting conventional wisdom — which I've found to be anything but wise, and to almost without exception be a tissue of lies intended to imprison them.

Roughly, 99% of the career advice our kids get is baloney. Ditto health advice, political, religious, and so on. Boy, have I turned into an iconoclast! Society and the media pressure our kids to poison their bodies and stunt their minds, and you parents are willing co-conspirators, even if unknowing ones.

Grumble.

Drugs

We, with the help of our public school system and media, have made one hell of a mess of things. Since our journalists are a product of the same school system, it's really unfair to blame them. The end result is that we have allowed ourselves to be totally dominated by a government that's very different from that envisioned by the framers of the Constitution. We've continued to sit silently while Congress has been making a terrible mess for us.

So we, through ignorance and passivity, have allowed our government to not just waste billions of our dollars on really stupid projects, but we've seen these projects seriously hurting our country — and our quality of life.

Yes, I mean the so-called War on Poverty and the War on Drugs. But beyond those incredibly expensive fiascos, I challenge you to name one single federal project that hasn't caused more problems than solutions. Congress, bribed by lobbyists, has wasted our money on price supports which make us pay more for things, and they've seriously screwed up education, agriculture, transportation, communications, health care, immigration, and so on.

Before the War on Poverty it used to be that poor immigrants came here, worked like the devil, and their kids graduated into our middle class.

But it's the War on Drugs that's done even more damage. We managed not to learn anything from the outlawing of alcohol in 1920. That was a bonanza which brought us organized crime, which is still with us. Before Prohibition alcohol use had been dropping — particularly hard liquor. Prohibition increased the prices and the desirability of liquor. Drinking was the "smart" thing to do.

You probably were amazed at the black reaction to the O.J. Simpson verdict. I don't recall seeing much in the media about *why* that happened. If you knew that one in four blacks was either in prison or on parole, with around 90% of them there for drug arrests, and that in virtually every case the police lied at the trials, you might get a hint as to why blacks don't trust the police, our courts, or the government.

We have over two million people in prison, mostly black, and it's costing us about $60 billion a year to house 'em. So we're busy hiring more police, appointing more judges, and building more prisons to keep this farce going. We're also watching our constitutional civil rights being trashed. Yep, the Congress *you* elected (and then reelected) is spending around $300 a year of your hard earned money to continue this mess.

Am I suggesting that we legalize drugs? Horrors!

Let me explain this clearly: No one who is in favor of continuing the drug prohibition has made any effort to understand the whole picture. Well, except those who are making money as a result of the program. The police are all for it. We'd need about a tenth as many police without the "Drug War." Our lawyers and courts are making billions on the deal, so they have a powerful vested interest in its perpetuation.

It seems as if every time Congress tries to do social engineering they end up wasting billions of our money, building a new bureaucracy, and providing us with a host of really awful unintended consequences. Our school system, because of government control, is the worst in the developed world — as well as the most expensive. The same holds for our health (har-de-har) care system, welfare, farm controls, and so on. It's been one incredibly expensive debacle after another. Yet you ignore all this and happily reelect the guys who are doing this to you with your

money. Wake the hell up!

I don't even know where to start in explaining about drugs — other than that almost everything you've been told or read is probably a lie. Yes, your beloved government has been and is lying to you. These are the people who have brought you the IRS, the FDA, the EPA, and other bureaus which are gradually taking away your freedom. I should say corrupt bureaus.

Why do we have the huge escalation of crime in America? Why do we have the spectacle of hundreds of thousands of corrupt police, lawyers, judges and politicians? It's the money, stupid! The incredible profits selling drugs generates. Profits which make America the murder capital of the world. Profits which subvert all but the stupidest public officials.

You don't see anyone making a living selling beer to kids, do you? The gangsters went out of the alcohol business when Prohibition was repealed.

But, the cry goes up, if we legalize drugs, we'll have a nation of drug addicts. I heard that from Senator Humphrey when I tried to discuss the problem with him several years ago. He wouldn't even talk about it. He was ignorant on the subject and had no interest in learning. And this, even though he had picked me as one of his personal advisors.

You've heard the government mantra that smoking pot leads to the use of harder drugs. What you don't hear is that every research report on the subject says this is baloney. The fact is that pot is a lot less addictive than alcohol, and much less damaging to one's body.

In the Netherlands, where they've legalized drugs, drug use has dropped significantly.

Then there's the horror of crack cocaine. What you don't know is that when drugs are legalized crack disappears. The main reason crack is so popular is that it's easy to make and cheap. Cocaine, which is more expensive, provides a longer and better high, so those who can afford it go for the better drug. If we legalized drugs their cost would drop about 90% and our black youth could start working at jobs instead of selling dope. Murders would drop by around 95%, our prisons would gradually empty, our police would have to find more honest work, and our lawyers and judges would be up that famous creek without a paddle, there not being all that much honest work for them.

No, I'm not suggesting that our cigarette companies be permitted to sell marijuana. I do have a plan which would make it so addicts would be able to get their drugs at a minimum cost, yet would not encourage new people to get involved. This approach has worked wherever it's been tried.

Right now, as a result of the overzealous police and ever more strict laws, physicians are quite reasonably afraid to prescribe painkilling drugs which are desperately needed by dying cancer patients. The medical association has been taking the licenses away from physicians who have been doing that — backed up by our courts. The result is that if you continue to abuse your body, reducing your immune system's ability to keep cancerous cells under control, you are very likely going to be in for months to even years of excruciating pain before you die. Sure, there are painkillers which would make life bearable for you, but no doctor will let you have them. And never mind that research has shown that the medical use of narcotics rarely results in addiction.

Please read some of the literature and find out how you've been lied to by the government and the media about drugs. I wrote about this in my 1992 book (now out of print), *We the People Declare War on Our Lousy Government.* I explained the problem and the solutions that have been successfully implemented in a few other countries. Yeah, I should take a few days, update the book, and put out another edition. But there's only so much of me to go around, so that'll have to wait.

An excellent recent book is *Drug Crazy* by Mike Gray. The subtitle is: "How We Got Into the Mess & How We Can Get Out." It's $24 from Random House.

Or you can do nothing and continue to live in a crime-ridden country with ever-worsening race relations, paying around $500 a year out of your own pocket via the IRS for your laziness. Your choice.

Oh yes, I'd almost forgotten: When they legalized pornography in Denmark and the Netherlands, porno shops opened up all over the major cities. Within a couple of years they were almost all gone, just through a lack of interest and customers. As soon as the social do-gooders get something made illegal, in rush the criminals, the prices go up, and suddenly it's attractive to the public.

Today, after hundreds of billions of dollars wasted on the drug war, drugs are available anywhere in the country. There are crack houses in Manchester, New Hampshire, and I could score just about anything I want, even in tiny Peterborough. 73

Number 62 on your Feedback card

Propagation

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January is expected to produce Fair to Good propagation on the HF bands during most days of the month. However, you may expect Poor to Very Poor conditions between the 23rd and 27th, with the 25th and 26th being the poorest. Remember that propagation conditions during the winter months are *not* as good as those during the spring and fall months in the northern hemisphere. DX signals will be weaker, and the bands between 20 and 10 will close earlier. However, QRN (static) will be less, and the HF band between 160 and 20 meters will really produce some fine DX on most days, particularly the 5th–7th; 11th–14th, and 18th–21st (see calendar).

10–12 meters

Possible openings to Europe in the morning, midday openings to Africa and South America, and late afternoon openings to Australasia and the South Pacific. Daytime short-skip openings between 1000 and 2000+ miles are likely as well.

15–17 meters

Worldwide DX possible during daylight hours, peaking toward Europe and the east in early morning, toward the southern hemisphere in the afternoon, and toward the west, South Pacific and Australasia in the late afternoon, with daytime short skip from 1000 to over 2000 miles.

20–30 meters

Openings to Europe and the east during late afternoon hours, with the bands remaining open to various areas of the world during hours of darkness until shortly after sunrise. Daylight short skip to 1000 miles and 2000 miles or so at night.

40 meters

Generally low noise prevails, and openings toward Europe and the east beginning in late afternoon, with the band remaining open all night until after sunrise to various areas of the world. Daytime short skip to about 1000 miles and over 1000 miles at night. This *could* be your best DX band this month!

80 meters

DX to all areas of the world between dark and dawn with signals peaking toward Europe and east around midnight, and to other directions just before dawn. Daytime short skip to 500 miles and nighttime openings to 2000 miles or so.

January 1999

SUN	MON	TUE	WED	THU	FRI	SAT
					1 F-G	2 G-F
3 F	4 F-G	5 G	6 G	7 G	8 G-F	9 F
10 F-G	11 G	12 G	13 G	14 G	15 G-F	16 F
17 F-G	18 G	19 G	20 G	21 G-F	22 F	23 F-P
24 P	25 P	26 P	27 P-F	28 F	29 F	30 F
31 F						

160 meters

DX possible during early evening and hours of darkness. No daytime short skip, but excellent possibilities at night from 500 to about 1500 miles.

Don't forget to work the *darkness path* (±30 minutes around local sunset).

Check the bands above and below the suggested ones for possible DX surprises. It's often a good idea to park your receiver on a seemingly unused frequency and just wait. A DX station is very likely to pop up before any one else hears him, and you can snag a good catch. Good hunting, and Happy New Year! W1XU/7.

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	15	20					20	20				15
ARGENTINA	20	40	40	40			20	15	15	10	10	15
AUSTRALIA	15	20	20		40	40	40			20	20	15
CANAL ZONE	20	20	20	20	20	20	20	15	10	10	15	15
ENGLAND	40	40	40	40		20	15	10	15	20	20	
HAWAII	15	20					20	20	20	10	10	15
INDIA							20	20				
JAPAN	15	20					20	20				15
MEXICO	20	20	20	20	20	20	20	15	10	10	15	15
PHILIPPINES							20	20				
PUERTO RICO	20	20	20	20	20	20	20	15	10	10	15	15
RUSSIA (C.I.S.)							20	15	20	20		
SOUTH AFRICA	20	40					20	10	10	10	15	20
WEST COAST	15/20	20/40	80	160	160	160				10	10	15

CENTRAL UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	15							20				15
ARGENTINA	20	20	20	40	40		20	20	15	10	15	15
AUSTRALIA	15	20	20				40				15	10
CANAL ZONE	15	20	40	40	40		20	15	10	10	10	15
ENGLAND	40	40	60					20	15	15	20	40
HAWAII	15	20		40	40	40	40	20	20	15	10	15
INDIA								20				
JAPAN	15							20				15
MEXICO	15	20	40	40	40		20	15	10	10	10	15
PHILIPPINES	15	20						20				15
PUERTO RICO	15	20	40	40	40		20	15	10	10	10	15
RUSSIA (C.I.S.)								20	15	20		
SOUTH AFRICA	20	40						15	10	10	15	20

WESTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	10	15	20				40	40	40			20
ARGENTINA	15	20		40	40			20		10	10	15
AUSTRALIA	10	15	20	20			40	40	20	20	15	15
CANAL ZONE	15	20	20					20	15	10	10	10
ENGLAND	20	40	40						15	15	20	20
HAWAII	10	15	20	40	40	40		20	20	15	15	10
INDIA		15	20						20			
JAPAN	10	15	20				40	40	40			20
MEXICO	15	20	20					20	15	10	10	10
PHILIPPINES	10	15/20	15/20			40	40	40		20		20
PUERTO RICO	15	20	20				40	40	40			20
RUSSIA (C.I.S.)									20	20		
SOUTH AFRICA	20	20							15	10	15	15
EAST COAST	15/20	20/40	80	160	160	160				10	10	15

Radio Bookshop

Here are some of the books Wayne has written. Some can change your life, if you'll let them. If the idea of being healthy, wealthy and wise is of interest to you, start reading. Yes, yon can be all that, but only when you know the secrets which Wayne has spent a lifetime uncovering.

The Secret Guide to Health: Yes, there really is a secret to regaining your health and adding 30 to 60 years of healthy living to your life. The answer is simple, but it means making some very difficult changes. Will you be skiing the slopes of Aspen with me when you're 90 or doddering around a nursing home? Or pushing up daisies? No, I'm not selling any health products. $5 (H)

The Secret Guide to Wealth: Just as with health, you'll find that you have been brainwashed by "the system" into a pattern of life that will keep you from ever making much money and having the freedom to travel and do what you want. I explain how anyone can get a dream job with no college, no résumé, and even without any experience. I explain how you can get someone to happily pay you to learn what you need to know to start your own business. $5 (M)

The Secret Guide to Wisdom: This is a review of around a hundred books that will help you change your life. No, I don't sell these books. They're on a wide range of subjects and will help to make you a very interesting person. Wait'll you see some of the gems you've missed reading. $5 (B)

Cold Fusion Overview: This is both a brief history of cold fusion, which I predict will be one of the largest industries in the world in the 21st century, plus a simple explanation of how and why it works. This new field is going to generate a whole new bunch of billionaires, just as the personal computer industry did. $5 (C)

The Bioelectrifier Handbook: This explains how to build or buy a little electrical gadget that can help clean the blood of any virus, microbe, parasite, fungus or yeast. The process was discovered by scientists at the Albert Einstein College of Medicine, patented, and then hushed up. It's curing AIDS, hepatitis C, and a bunch of other serious illnesses. The circuit can be built for under $20 from the instructions in the book. $10 (A)

Moondoggle: After reading René's book, *NASA Mooned America*, I read everything I could find on our Moon landings. I watched the videos, looked carefully at the photos, read the astronaughts' biographies, and talked with some of my readers who worked for NASA. This book cites 25 good reasons I believe the whole Apollo program had to have been faked. $5 (D)

Mankind's Extinction Predictions: If any one of the experts who have written books predicting a soon-to-come catastrophe which will virtually wipe us all out are right, we're in trouble. In this book I explain about the various disaster scenarios, from Nostradamus, who says the poles will soon shift, wiping out 97% of mankind, to Sai Baba, who has recently warned his followers to get out of Japan and Australia before January 6th this year. The worst part of these predictions is the accuracy record of some of the experts. Will it be a pole shift, a new ice age, a massive solar flare, a comet or asteroid, or even Y2K? I'm getting ready, how about you? $5 (E)

Wayne's Submarine Adventures in WWII: Yes, I spent from 1943-1945 on a submarine, right in the middle of the war with Japan. We almost got sunk several times, and twice I was in the right place at the right time to save the boat. What's it really like to be depth charged? And what's the daily life aboard a submarine like? There are some very funny stories. If you're near Mobile, please visit the Drum. $5 (S)

Improving State Government: Here are 24 ways that almost any state government can cut expenses enormously, while providing far better services. I explain how any government bureau or department can be gotten to cut its expenses by at least 50% in three years and do it cooperatively and enthusiastically. I explain how, by applying a new technology, the state can make it possible to provide all needed services without having to levy *any* taxes at all! Read the book, run for your legislature, and let's get busy making this country work like its founders wanted it to. Don't leave this for "someone else" to do. $5 (L)

Travel Diaries: You can travel amazingly inexpensively – once you know the ropes. Enjoy Sherry and my budget visits to Europe, Russia, and a bunch of other interesting places. How about a first class flight to Munich, a rented Audi, driving to visit Vienna, Krakow in Poland (and the famous salt mines), Prague, back to Munich, and the first class flight home for two, all for under $1,000. Yes, when you know how you can travel inexpensively, and still stay in first class hotels. $5 (T)

Wayne's Caribbean Adventures: More budget travel stories – where I visit the hams and scuba dive most of the islands of the Caribbean. Like the special Liat fare which allowed us to visit 11 countries in 21 days, with me diving all but one of the islands, Guadeloupe, where the hams kept me so busy with parties I didn't have time to dive. $5 (U)

Silver Wire: With two 3" pieces of heavy pure silver wire + three 9V batteries you can make a thousand dollars worth of silver colloid. What do you do with it? It does what the antibiotics do, but germs can't adapt to it. Use it to get rid of germs on food, for skin fungus, warts, and even to drink. Read some books on the uses of silver colloid, it's like magic. $15 (Y)

Classical Music Guide: A list of 100 CDs which will provide you with an outstanding collection of the finest classical music ever written. This is what you need to help you reduce stress. Classical music also raises youngsters' IQs, helps plants grow faster, and will make you healthier. Just wait'll you hear some of Gotschalk's fabulous music! $5 (Z)

Reprints of My Editorials from *73*.

Grist I: 50 of my best non-ham oriented editorials from before 1997. $5 (F)

Grist II: 50 more choice non-ham editorials from before 1997. $5 (G)

1997 Editorials: 240 pages. 216 editorials discussing health, ideas for new businesses, exciting new books I've discovered, ways to cure our country's more serious problems, flight 800, the Oklahoma City bombing, more Moon madness, and so on. In three $5 volumes. $15 (O)

1999 Jan-Aug Editorials: 188 pages in two $5 volumes. Bringing you up to date. $10 (P)

Ham-to-Ham: 45 of my ham-oriented editorials. These will help you bone up on ham history. Great stuff for ham club newsletter filler. Yes, of course these are controversial. $5 (Q)

$1 Million Sales Video: How to generate extra million in sales using PR. This will be one of the best investments your business ever made. $43 (V)

One Hour CW: Using this sneaky method even *you* can learn the Morse Code in one hour and pass that dumb 5wpm Tech-Plus ham test. $5. (CW)

Code Tape (T5): This tape will teach you the letters, numbers and punctuation you need to know if you are going on to learn the code at 13 wpm or 20 wpm. $5 (T5)

Code Tape (T13): Once you know the code for the letters (T5) you can go immediately to copying 13 wpm code (using my system). This should only take two or three days. $5 (T13)

Code Tape (T20): Start right out at 20 wpm and master it in a weekend for your Extra Class license. $5 (T20)

Code Tape (T25): Same deal. It doesn't take any longer to handle 25 wpm as it does 13. Or use the ARRL system & take six months. $5 (T25)

Wayne Talks at Dayton: This is a 90-minute tape of the talk I'd have given at the Dayton, if invited. $5 (W1)

Wayne Talks at Tampa: This is the talk I gave at the Tampa Global Sciences conference. I cover cold fusion, amateur radio, health, books you should read, and so on. $5 (W2)

Stuff I didn't write, but you need:

NASA Mooned America: René makes an air-tight case that NASA faked the Moon landings. This book will convince even you. $25 (R1)

Last Skeptic of Science: This is René's book where he debunks a bunch of accepted scientific beliefs – such as the ice ages, the Earth being a magnet, the Moon causing the tides, and etc. $25 (R2)

Elemental Energy Subscription: I predict this is going to be the largest industry in the world in about 20-30 years. They laughed at me when I predicted the personal computer growth in 1975. PCs are now the third largest industry in the world. The elemental energy ground floor is still wide open, but then that might mean giving up watching ball games and talk shows on the boob tube. $30 for six issues. (EE). A sample issue is $10.

Three Gatto Talks: A prize-winning teacher explains what's wrong with American schools and why our kids are not being educated. Why are Swedish youngsters, who start school at 7 years of age, leaving our kids in the dust? Our kids are intentionally being dumbed down by our school system — the least effective and most expensive in the world. $5 (K)

......*Wayne*

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Yes! Put me down for a year of *73* for only $25 (a steal). Canada US$32. Foreign US$44 by sea, US$67 by air. Whew!

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Turn your old ham and computer gear into cash now. Sure, you can wait for a hamfest to try and dump it, but you know you'll get a far more realistic price if you have it out where 100,000 active ham potential buyers can see it, rather than the few hundred local hams who come by a flea market table. Check your attic, garage, cellar and closet shelves and get cash for your ham and computer gear before it's too old to sell. You know you're not going to use it again, so why leave it for your widow to throw out? That stuff isn't getting any younger!

The *73* Flea Market, Barter 'n' Buy, costs you peanuts (almost)—comes to 35 cents a word for individual (noncommercial!) ads and $1.00 a word for commercial ads. Don't plan on telling a long story. Use abbreviations, cram it in. But be honest. There are plenty of hams who love to fix things, so if it doesn't work, say so.

Make your list, count the words, including your call, address and phone number. Include a check or your credit card number and expiration. If you're placing a commercial ad, include an additional phone number, separate from your ad.

This is a monthly magazine, not a daily newspaper, so figure a couple months before the action starts; then be prepared. If you get too many calls, you priced it low. If you don't get many calls, too high.

So get busy. Blow the dust off, check everything out, make sure it still works right and maybe you can help make a ham newcomer or retired old timer happy with that rig you're not using now. Or you might get busy on your computer and put together a list of small gear/parts to send to those interested?

Send your ads and payment to: *73 Magazine*, Barter 'n' Buy, 70 Rt. 202N, Peterborough NH 03458 and get set for the phone calls. The deadline for the April 1999 classified ad section is February 10, 1999.

Special Addition

Hunting Indian Lions in the Air

Bangalore, the "Garden City of India" and "India's Silicon Valley," and the capital of Karnataka, is also known as "India's Ham Capital," since nearly 10% of India's hams reside in the city. It was the first Indian city to have an amateur radio club, a repeater, a digital mailbox, packet BBS, radio direction finding competitions ... and last October the Bangalore ARC held India's first hamfest, a three-day event that attracted nearly 800 attendees from all over the subcontinent of India.

The Lions Club of Bangalore North invites all amateur operators and SWLs to participate in the 28th annual Hunting Lions in the Air Contest, from Saturday, January 9, 1999 (0900 UTC), to Sunday, January 10, 1999 (2100 UTC). How many people get invited to hunt Indian lions? Don't miss this opportunity! Get in touch and get the rules at *[http://www.angelfire.com/in/vu2jhm]* or *[http://welcome.to/lionsclub]*. E-mail the Lions Club at *[lions.324d1@usa.net]*.

The Bangalore ARC issues a warm welcome for any ham visiting Bangalore, in person or on the air, especially on two meters. QSP, QSLs are handled at the BARC, Post Box #5053, GPO, Bangalore 560 001, INDIA; E-mail [vu2arc@hotmail.com].

Photo A. Special Indian postal cover celebrated World Amateur Radio Centenary.

73 Amateur Radio Today

FEBRUARY 1999
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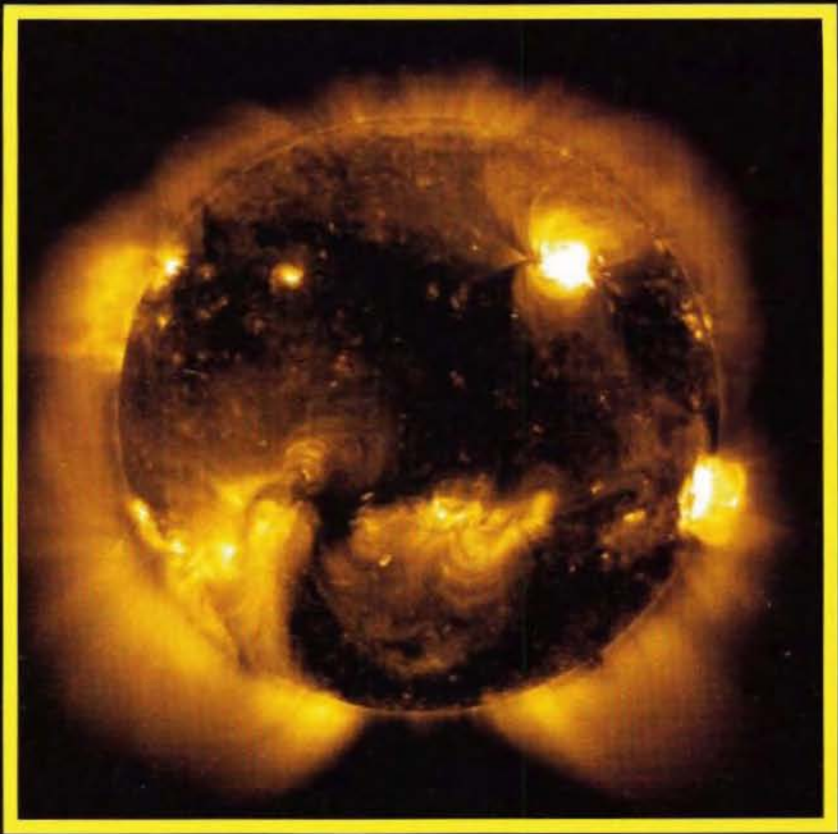
Monitoring Solar Mischief



Which Antenna Is Best for You?

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And a VFO, Too!

Review:

IC-706MKII — Wow!

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FEBRUARY 1999
ISSUE #461

73® Amateur Radio Today

TABLE OF CONTENTS

FEATURES

DEPARTMENTS

REVIEW

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On the cover: "Here Comes the Sun: Part 2" begins on page 34. Photo courtesy of NASA's *SOHO* satellite. Image taken May 6, 1998 — day of a huge X-class flare.

Feedback: Any circuit works better with feedback, so please take the time to report on how much you like, hate, or don't care one way or the other about the articles and columns in this issue. G = great!, O = okay, and U = ugh. The G's and O's will be continued. Enough U's and it's Silent Keysville. Hey, this is *your* communications medium, so don't just sit there scratching your...er...head. FYI: Feedback "number" is usually the page number on which the article or column starts.

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Number 1 on your Feedback card

NEVER SAY DIE

Wayne Green W2NSD/1

Cancer!

If you don't have it yet, you or someone in your family probably will. You certainly must have some friends with cancer. The wife of the chap who picks up my garbage has cancer. So does my ex-wife (the nicer one).

Once cancer strikes, the patient (victim) has two choices — go to the doctor and run up tens of thousands of dollars in hospital bills, endure the torture of chemo and radiation "therapy," or start some self-education on the subject and look for alternatives. It doesn't take much reading to find out that cancer was almost unknown a hundred years ago and that Dr. Schweitzer said he never ran across one single case of cancer in Africa until the Africans started eating the European diet. None. Golly, do you suppose that what we've been eating may be connected to the cancer epidemic?

If you know anyone with cancer who hasn't totally turned over all responsibility for their life to the medical professionals, you may be able to help them find out both why they got the Big C and how to get rid of it without the pain, suffering, and unlikely success (not to mention expense) of the accepted medical treatments. They should take the word "treat" out of treatment.

You're probably aware that the National Cancer Institute and the American Cancer Society have spent billions of your dollars looking to develop a pill or shot that will stop cancer. They haven't spent *bupkes* on looking into preventing cancer in the first place. Well, there's no money in that for them, the AMA, the FDA, the hospitals, or the drug companies. People only spend money after they get sick, then they'll spend all they and their families have.

Anyway, when someone manages to encancerate himself, my recommendation is to get the victim a copy of the $15 Dr. Bruno Comby book, *Maximize Immunity* (905-478-2201). Yes, of course, I've reviewed it in my *Secret Guide to Wisdom*. Second, I'd send for copies of Dr. Lorraine Day's videos describing how she cured her own cancer just by changing her diet (800-574-2437). Thirdly, it wouldn't hurt to nail down the cause and cure by getting a $15 copy of *Nature's First Law: The Raw Food Diet* (800-205-2350). To do any less could be to sentence your friend (or yourself) to death.

Yes, I know how much you enjoy coffee, Coke, Big Macs, chocolate, ice cream, and so on. Are these habits really worth dying prematurely for? Slowly and painfully prematurely?

The more research I do, the more I'm convinced that cancer, heart trouble, strokes, arthritis, diabetes, and all the other things that are shortening our lives, or at least making them more difficult, are completely avoidable. But getting the word out, or, worse, convincing people even to take an interest in stopping them killing themselves, seems a lost cause. So, though I'd like to say something when I see a grossly fat person — about just changing their damned diet — I know they'll get mad and don't even want to hear anything about how to cure the illness that's making their life miserable and going to cut it very short.

We have over 8,000 hospitals in America. If we could get people to change their diets, I think we could put around 6,000 of 'em out of business and cut around a trillion dollars from our medical bills. That's about $4,000 per taxpayer per year! Yeah, this would put a lot of insurance and pharmaceutical companies out of business. Tough. But without your employer having to take all those medical payments out of your paycheck before you even see it, this would amount to a four-thousand-dollar raise.

I'm sure Congress would have no problem in finding other ways to spend the hundreds of billions in federal funds this would save.

So we have a trillion-and-a-half vested interest in your *not* finding out that it's your diet that's making you sick — and killing you — when your life should be only half over, and no constituency to help bring about change. Money runs this country, not the interests of the people.

The Odds

A little item in *Time* caught my eye. Well, it mentioned cancer and nursing homes. It seems that a recent study showed that 40% of the cancer patients in nursing homes get too little or no pain medication. Not even aspirin! I don't know if you've had a family member who died of cancer, but when I lived in Brooklyn the guy across the street did and his screams of pain could be heard day and night for months.

This is, of course, of little importance to you if you are not ever going to (a) live in a nursing home, and (b) get cancer. Well, unless you change your lifestyle significantly, your odds are not good. Around 60% of our elderly are ending their days in nursing homes, where there is little to do and the food sucks. Add to that the 40% who will get cancer (heading toward 50% as we continue to smoke and sugar ourselves to death), and you are playing against serious odds.

How come all the pain? Well, two things: First, there's the cost of drugs, and second, the medical police and the drug enforcement people are looking for any doctors who've been prescribing painkillers. Several have lost their licenses just through prescribing pain-killing drugs for terminal cancer patients.

Both cancer and nursing homes are avoidable if you stop doing bad things to your body. Oh, to heck with the fat, the nursing homes, and the incredible pain of cancer — pass me another doughnut!

Another Opportunity

A chap at the Peoria SuperFest had a copy of the Karlson Enclosure booklet I put out in 1952 which he wanted me to autograph. He'd been able to buy a couple of the speaker enclosures at an auction for a very reasonable price, mainly because no one else there knew what they were.

I've been to the Consumer Electronic Show audio demonstrations in Chicago and Las Vegas and there's not one speaker system being made today at any price that comes even close to the performance a good speaker will produce in a Karlson Enclosure.

Sure, you need a good hi-fi system and a good speaker, but the last link in the chain is the speaker cabinet.

Audiophile friends who visit me are astounded at the sounds my system produces, and my

Continued on page 54

Number 6 on your Feedback card

QRX . . .

The Bad Ones ...

FBI Busts Georgia Ham

An FBI statement issued in December 1998 said that Kevin M. Kelly N2BYE, an Advanced class licensee, was arrested without incident November 6th at his Cumming, Georgia, home by FBI agents accompanied by FAA and FCC agents. The arrest followed a search of Kelly's residence.

Kelly was charged in a criminal complaint with four counts of breaking federal law prohibiting knowingly interfering with the operation of a "true light" or signal used at an air navigation facility. The FBI said its case stemmed from FAA reports of "sporadic and momentary radio frequency interference" between aircraft and air traffic controller communications. The FBI said an extensive investigation showed the RF interference to be coming from the Hyde Park subdivision in Cumming where Kelly lived.

The FBI described Kelly, 46, as "a highly experienced electronics engineer" who was said to have been "extremely upset" about air traffic noise above his home.

From December 1998's *Badger State Smoke Signals*, Jim Romelfanger K9ZZ, editor.

Pirates Popped

The FCC has pulled the plugs on four unauthorized HF broadcasters in Massachusetts, Illinois, Texas, and California. The stations all transmitted on 6955 kHz. Two of the operators are radio amateurs, according to an FCC spokesperson, who said the ham licenses "are definitely in jeopardy." The two hams were identified as 41-year-old Richard F. Jurrens KC5RGK, a Technician licensee who lives in Katy, Texas, and 46-year-old Henry Lee "Hank" Landsberg WB6MEU, an Advanced class licensee who lives in Sierra Madre, California. The names of the others cited were being withheld pending further official action.

In making the arrests, the FCC's Columbia (Maryland) Operations Center coordinated and provided information to FCC agents from the Boston, Chicago, Houston and Los Angeles offices. FCC inspectors from those offices then performed on-site visits to the unauthorized stations.

With the exception of certain low-power Part 15 devices, broadcasting on the HF bands is not authorized without a station license. Under the Communications Act, violators may be subject to penalties of up to $11,000 and the equipment used may be seized and forfeited by court order. Unlicensed operators also face criminal fines of up to $100,000 and/or imprisonment for up to one year, or both, for a first-time offense.

From *The ARRL Letter*, via December's *Badger State Smoke Signals*, Jim Romelfanger K9ZZ, editor.

Shame on Somebody

This appeared in the October 1998 issue of *The Algoma Amateur*, the newsletter of the Algoma ARC, Walt Kimball VE3CWE, editor.

During Hurricane Bonnie, I took the opportunity to listen to the hurricane tracking net on 14.300 kHz. It was a well-organized net, controlled out of Florida, but communications were extremely difficult, in spite of reasonably good band conditions.

I don't think I have ever heard jamming done so effectively on any frequency before. There were two distinct stations broadcasting country-and-western music, plus another that broke in periodically with chimes. One music station was in the south, and the other appeared to be out west. Both had signals at least 10 dB over 9. Sometimes both were on together, and at other times they were doing it solo. They kept this up for several days while the net was active.

When you consider the importance of a hurricane tracking net, giving warning of how and where the storm was moving, etc., you have to think of how many lives and how much damage they might be able to save—and yet these were amateur radio operators doing their best to stop communications.

From *ARNS Bulletin*, December 1998, Steve Auyer N2TKX, editor.

FCC Cracks Down on Fraud

Several sites on the World Wide Web are apparently dedicated to thwarting the FCC license fraud enforcement effort. While it is impossible to say who is really sponsoring the Web locations, the rhetoric from site to site has a familiar ring. The majority of the sites claim that everyone has the constitutional right to do and say what he wants on the ham bands. Some reportedly go so far as to say that the government cannot do anything to stop what the majority in the ham community see as malicious interference.

On one Web site there was even a scanned copy of an FCC letter to an alleged violator. The letter appears authentic, and is signed by W. Riley Hollingsworth. Hollingsworth is the legal advisor to the FCC's Compliance and Information Bureau and the point man in this latest enforcement effort. It details the complaints and advised the alleged violator to call Hollingsworth's office to discuss the matter.

Meanwhile, several Internet bulletin boards are becoming filled with rhetoric from supporters of those believed to be targeted by the government for enforcement action. The words posted urge everyone to ignore the FCC and continue to operate on the air in any way that they like.

From *Newsline*, Bill Pasternak WA6ITF, editor.

... and now The Good Ones

Emma's Radio Project

The United Kingdom's 1998 "Young Amateur of the Year," Emma Constantine 2E1BVJ, has issued a radio construction challenge that has quickly become a sponsored national United Kingdom ham radio youth contest.

Called "Emma's Challenge," the project involves building a six-meter three-watt FM portable transceiver for less than £50 (50 pounds) in British currency. Contestants have until the end of 1999 to submit their entries. The United Kingdom's Radiocommunications Agency has also pledged its support and has donated £1,000 worth of sponsorship.

The competition is open to all young British hams. Two main prizes will be awarded, for individual and group/club entries. For further information write to the RadCom office at RSGB Headquarters. The E-mail address is [radcom@rsgb.org.uk].

From RSGB, via *Newsline*, Bill Pasternak WA6ITF, editor.

Injured Storm Spotter Honored

Ham hero Lonnie McVaigh KB9LUN, of Decatur, Illinois, has been honored as the latest recipient of the prestigious Samuel I. Keene Memorial Service Award from the Disaster Preparedness-Emergency Response Association. McVaigh received the award November 19. It carries a $1000 honorarium. McVaigh was seriously injured while on storm-spotter duty.

"Instead of simply reporting the location and movement of the funnel cloud that threatened Decatur on April 19, 1996, Mr. McVaigh warned people to get off the street and into shelters as the tornado bore down on them," a DERA statement

Continued on page 8

QRX
continued from page 6

read. As time ran out, McVaigh took refuge with a family in their basement as the twister hit their house. He was seriously injured when the storm toppled the chimney into the basement.

McVaigh suffered a broken pelvis and nerve damage in his legs. He has had to endure several operations and a lengthy and difficult rehabilitation program. Because of his injuries, McVaigh can no longer work at his job and has had to rely on public assistance, Social Security, and help from friends and his church. The McVaighs have three children of their own, plus five foster children. His slow recovery continues.

DERA Executive Director Bascombe "Jay" Wilson WØAIR said the organization picked McVaigh from among candidates representing every continent. "The heroism and continued courage of Lonnie McVaigh serve as an inspiration for us all," Wilson said.

From January 1999's *LCARA Patch*, newsletter of the Lake County ARC, Painesville Ohio, Tim Culek KQ8TC, editor.

Tutu Challenge Boosts Club Membership

When Central Michigan Amateur Radio Club president Erv Bates W8ERV said he would wear a tutu if it increased the organization's membership, he probably never thought he would actually have to do it. Bates made the comment that he would wear the ballet dancewear if club membership reached 200 by November's meeting. It did—and Erv was informed that he was duty-bound to pay up at the club's December meeting.

According to club secretary Julie McLain KB8ZXR, Bates really looked cute in the "bumble bee" costume designed by Kim Carpenter, complete with antennae and wings. Want to see for yourself? Go to the club's photo gallery at their Web site: [www.qsl.net/cmarc/cp98b.html].

We were alerted to this club prez who's willing to make an extra effort to keep the ARC lively by *Newsline*, Bill Pasternak WA6ITF, editor.

Murphy's Laws of Amateur Radio

By Larry Waggoner WØKA

•Any important instruction or operating manual will have been discarded.

•Original drawings will be destroyed in the process of copying them.

•Any wire, cut to length, will be too short.

•Identical units tested under identical conditions will not be identical in the field.

•The availability of any component is inversely proportional to the need for that component.

•If a project requires X components, there will be X-1 in the junk box.

•If a particular resistance is needed, that value will not be available. Further, it cannot be developed with any possible series or parallel combination.

•A dropped tool will land where it can do the most damage. (Also known as the Law of Selective Gravitation.)

•A device selected at random from a group having 99% reliability will be a member of the 1% group.

•The probability of a component value being omitted from a plan or drawing is directly proportional to its importance.

•Interchangeable parts won't.

•Components that cannot and must not be assembled improperly will be.

•Any circuit that cannot fail will.

•A fail-safe circuit will destroy others.

•A transistor protected by a fast-blowing fuse will protect the fuse by blowing first.

•A self-starting oscillator won't.

•A crystal oscillator will oscillate at the wrong frequency ... *if* it oscillates.

•A PNP transistor will turn out to be NPN.

•A failure will not appear until a unit has passed final inspection.

•If an obviously defective component is replaced in an instrument with an intermittent fault, the fault will reappear after the unit is returned to service.

•After the last of 16 mounting screws has been removed from an access cover, it will be discovered that the wrong access cover has been removed.

•After an access cover has been secured by 16 hold-down screws, it will be discovered that the gasket has been omitted.

•After a rig has been fully assembled, extra components will be found on the bench.

•Regardless of what the club's newsletter editor sets as a deadline, the club president will submit his article two days later.

•If there are only three places to look for an item, you'll find it on the first try. If there are more than 10 places to look for it, you'll find it in the last place.

This somewhat cynical litany originally appeared in the *Bulletin* of the Kansas ARPSC; it was reprinted in the September 1998 issue of *The Electron*, the newsletter of the Sterling-Rock Falls ARS, and we borrowed it from the December 1998 *ARNS Bulletin*, Steve Auyer N2TKX, editor.

New Member

I see you at the meetings, but you never say "Hello."

You're busy all the time you're there, with those you already know.

I sit amongst the people, and yet I'm a lonesome one.

The new fish are as strange as I, you old members pass me by.

But darn it, you guys asked us in and you talk of fellowship;

You could just step across the room, but you've never made the trip.

Why can't you nod and say "Hello" and then Go sit among your friends? Now that I'd understand.

I'll be at your next meeting, perhaps a nicer night to spend.

Think you could introduce yourself? I want to be your friend!

No author has been credited, but the December 1998 *ARNS Bulletin* (Steve Auyer N2TKX, editor) claimed that this poem had appeared in the October 1998 *SPARKS*, newsletter of the Delta ARC, David Pace KU4AS, editor.

"... And Now for Something Completely Different ..."

Intense: Where campers sleep
Kinship: Your brother's boat
Midget: Center engine of a three-engine fast plane
Observatory: What Washington asked his spies to do
Paradise: Ivory cubes used in craps and backgammon
Paraffins: Found on the sides of fish
Rampage: Section of a book about male sheep
Sarcasm: Quip lash

A bit of E-mail humor found in the June 1998 issue of *ARNS Bulletin*, and no doubt in many other places, too! 73

UPDATES

Missing Info Makes for Confusion in Montana

In the January issue, in "Letters from the Ham Shack," we ran a letter from Gene Lynch WA7ZRA. He wrote Wayne that he still had the plans for the Karlson speaker cabinets he'd built some years ago, and that copies were available for anyone who wanted them.

We didn't mean to imply that they were *free*. If you'd like a copy of the multipage plans that produce the speaker enclosure Uncle Wayne says "is unequaled today," please send $10 in US funds, plus a two-stamp SASE to:

Gene Lynch WA7ZRA
Box 567
Boulder MT 59632.

We Must Be Dreaming

A home-brew receiver project!

Thomas K. Duncan
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With last summer's hamfest season promising all sorts of new occupants for the parts bin, I felt it was time to make room by cleaning out some of the previous several years' good finds. Homebrewing several HF receivers with Gilbert cell front ends taught me the perils of 40 meters—QRPers and half-megawatt broadcasters sharing the same band certainly tests dynamic range. As an SWL, I wanted to receive both. A receiver that would cover, say, 6.5 to 7.5 MHz seemed like both a challenging project and a way to clear space for this year's hamfest-find-of-the-century.

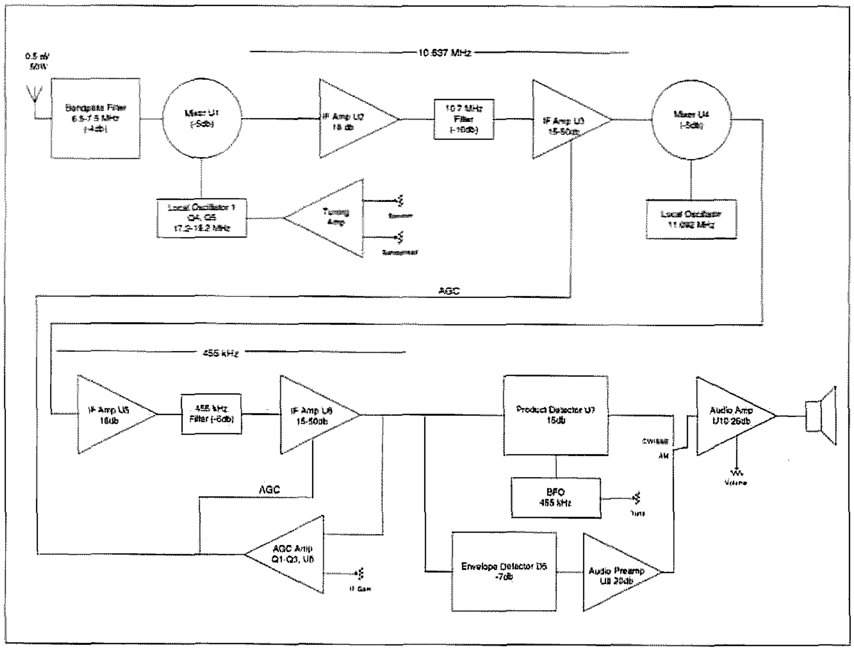

Fig. 1. Block diagram.

The circuit

Fig. 1 is the block diagram. Overall gain requirements were based on a 0.5 µV signal at the antenna delivering 0.25 W into an 8 Ω speaker, or 134 dB. Originally, the intent was to use OH2GF's synchronous detector for AM (*A Synchronous Detector for AM Transmissions*, Jukka Vermasvuori OH2GF, *QST*, July 1993). This requires 15 mV input into 50 Ω, so 90 dB gain is required before the detector, and 44 dB in the detector and audio sections. Ultimately, difficulty obtaining the NE604 or a suitable single-chip substitute in a standard DIP package led me to use a diode detector for AM and adapt OH2GF's product detector for CW and SSB.

The circuit is dual-conversion to improve image rejection. Double balanced diode mixers are used to generate the 10.637 MHz first IF and 455 kHz second IF. Ceramic filters are used between the first and second stages of each IF train. The MMIC first stages make up for mixer and filter losses, and provide 50 Ω terminations for the mixers. The AGC-controlled second stages provide the bulk of the gain.

The first local oscillator and BFO are both varactor-tuned. The BFO tuning voltage range is determined by two 10 k trimpots, with which my junk box still overflows. First local oscillator tuning voltage is developed through what may seem to be a needlessly complex circuit. The bandspread control is a 10-turn pot with nice smooth action, begging to be pressed into service, but at 100 Ω and 1/8 W, it cannot by itself supply a wide enough voltage difference to tune the varactors over the desired 1 MHz range. An op amp is therefore used to multiply the difference between the bandset and bandspread wiper voltages to produce between 2 V and 5 V at its output, corresponding to between 17 pF and 11 pF of tank capacitance, for a frequency range of 17.2 MHz to 18.2 MHz. The buffer amplifier adapted from a circuit in Hayward and DeMaw (*Solid State Design for the Radio Amateur*, Wes Hayward W7ZOI and Doug DeMaw W1FB; first local oscillator adapted from LO and BFO circuits for the 160 meter receiver in Chapter 6) isolates the oscillator and matches it to the 50 Ω first mixer local oscillator port. L9 adjusts the match to provide 0.5 V_{rms} (+7 dBm) injection.

The second local oscillator is a Pierce circuit using a readily available inexpensive crystal. At 11.092 MHz - 455 kHz = 10.637 MHz, the first IF is slightly off the usual 10.7 MHz, but the bandwidth of the first ceramic filter easily accommodates this. Similarly, the 10.7 MHz transformer has sufficient tuning range to adjust for a peak oscillator output of around 0.5 V_{rms} into the second mixer local oscillator port.

AGC is developed by amplifying second IF output through Q1 and Q2, rectifying through D6 and D7 and filtering the signal, and amplifying the resulting control signal through Q3 (see *1993 ARRL Handbook for Radio Amateurs;* AGC derived from Chapter 12, Fig. 43). The unity gain op amp functions as an inverter and level shifter, where the IF gain control sets the quiescent AGC voltage at pin 1 of U8 to between 4.5 and 6 V. As the second IF output increases, AGC voltage increases, reducing the gain of both MC1350s. AGC may be turned on and off by a push/pull switch mounted on the IF gain control, allowing IF gain to be adjusted manually even when AGC is used.

The other half of U8 is an audio preamplifier used to boost the envelope detector output to something near the output of the product detector. U7 has a conversion gain of around 15 dB, while the diode detector has a loss of around 7 dB. Most full-carrier AM signals in this receiver's range are broadcasters, so the 20 dB gain of the preamplifier is quite sufficient. Audio output is provided by U10, which

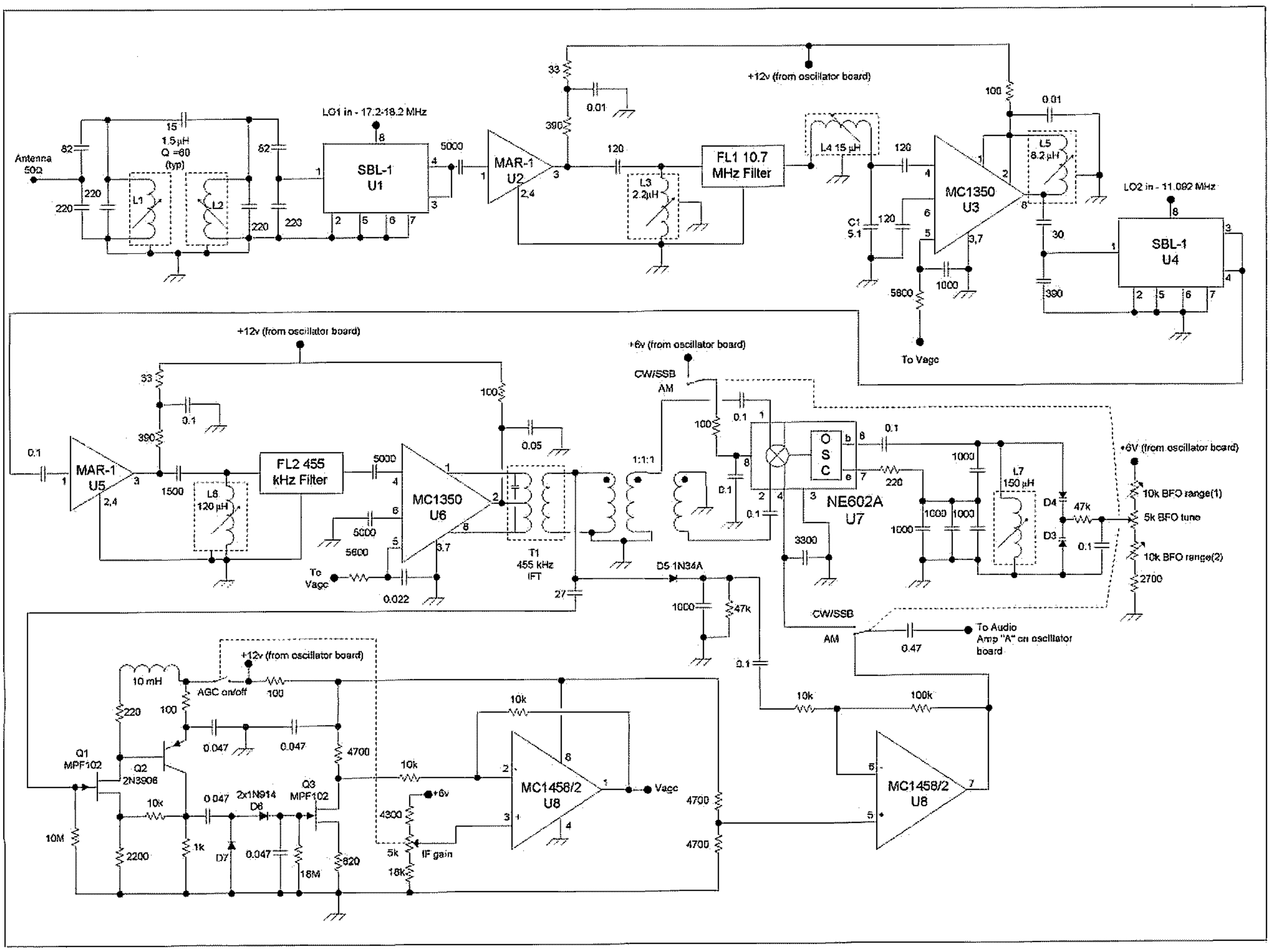

Fig. 2. Front end board schematic.

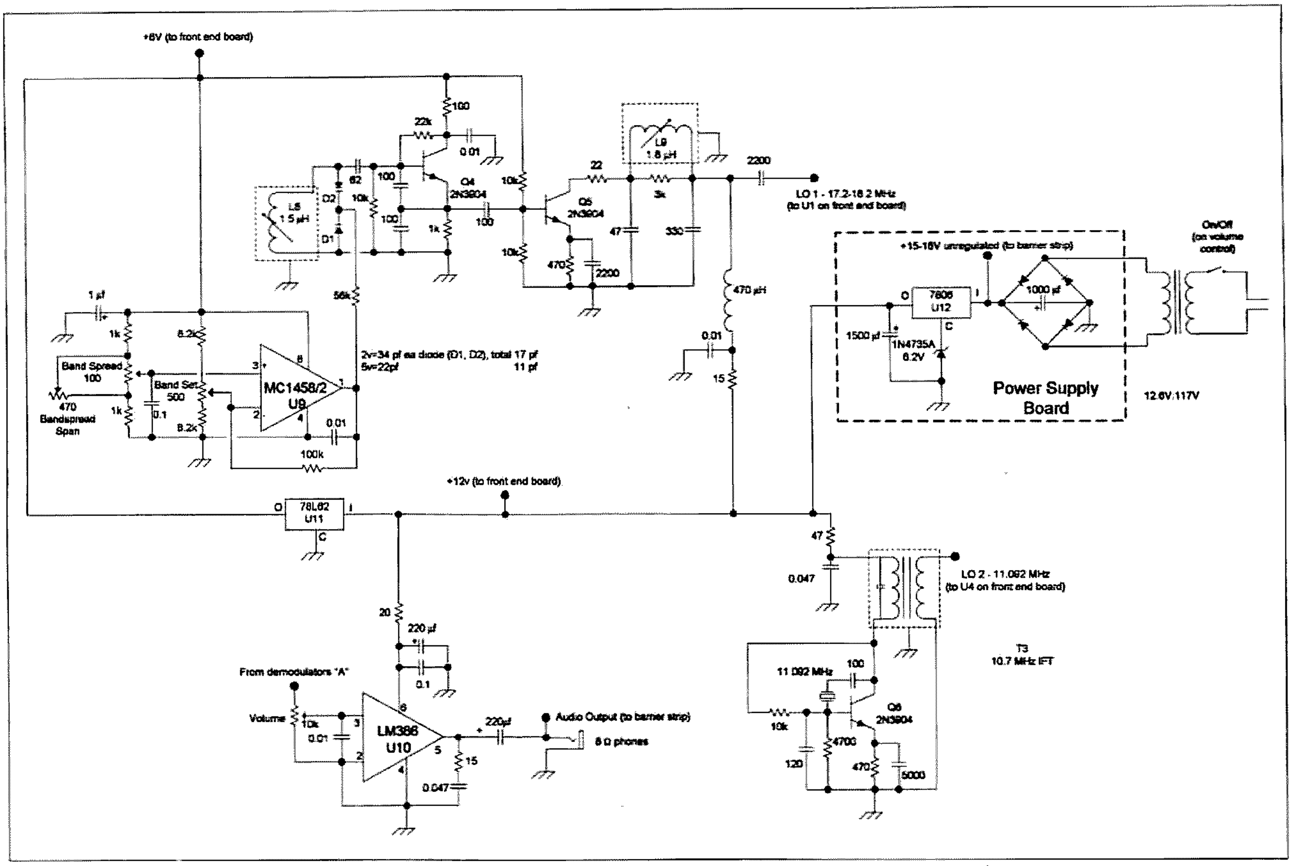

Fig. 3. Oscillator board schematic.

gives another 26 dB gain. The AM-CW/SSB switch is a 4PDT push/pull unit mounted on the BFO tuning control (just like the AGC switch and IF gain control), one section used to select AM or CW/SSB, and the other to turn the BFO on only in CW/SSB mode.

The power supply was added as an afterthought—the original board set was intended to be experimental and never make it off the work bench, but it worked well enough to justify a permanent power supply. The fact that the junk box had plenty of 6 V three-terminal regulators and zeners, but no 12 V units, accounts for the multiplicity of regulators. Those with different parts on hand may wish to replace U12 and the zener with a 7812. Auxiliary power connections allow operation off +12 V DC regulated, or +15 to +18 V unregulated. Total current required at +12 V is about 90 mA.

Construction

The circuit is laid out onto two five-inch by three-inch single-sided PC boards. The oscillator board shown in **Fig. 5** has the first local oscillator and tuning amplifier, the second local oscillator, and the audio power amplifier. Each local oscillator section is partially shielded. The front end board shown in **Fig. 4** holds the remainder of the circuit and has no overall shielding. Both boards have a good deal of unused space, but not so much that they could be easily combined onto one five-by-three-inch board. Most of the coils are shielded, so the circuit is well behaved even with the oscillator shields removed.

A three-inch by five-and-three-eighths-inch by six-inch box houses the boards and controls, with enough room left over for the power supply perfboard. Alas, the power transformer would not fit inside, so it's mounted on the outside of the rear panel. A barrier strip on the rear brings out the antenna, audio, ground, and auxiliary power connections.

Alignment

It is possible to roughly align the radio by tuning the two IF transformers "by ear" until some usable signal is

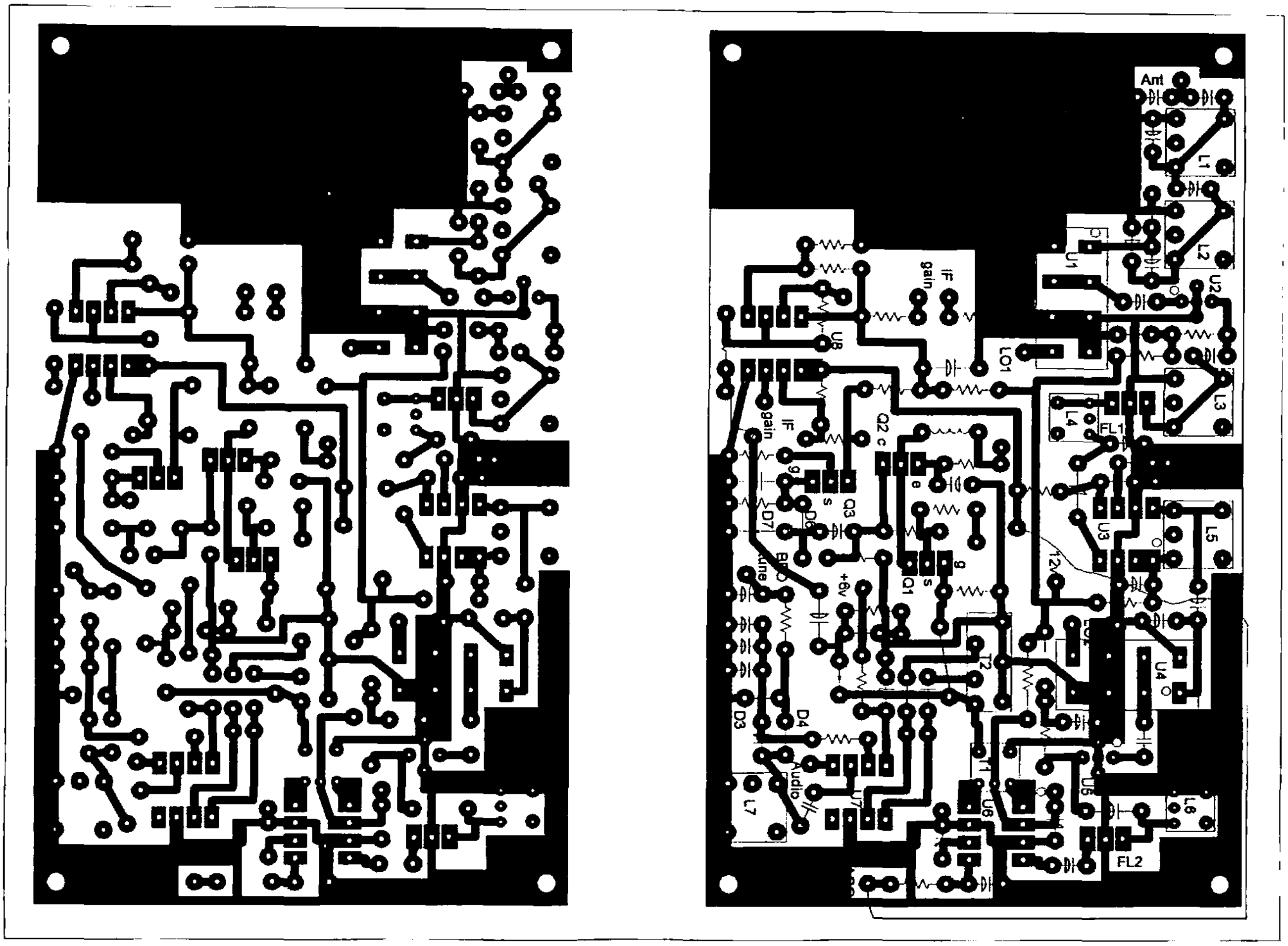

Fig. 4. (a) Front end board. (b) Parts layout from foil side.

found, and then adjusting L6, L5, L4, L3, L2, and L1 for peak signal. A more exact method follows, requiring a signal generator covering 7 MHz, voltmeter with RF probe or some other way of measuring RF voltages up to 20 MHz, and frequency counter.

With bandset and bandspread controls at center, the first local oscillator center frequency should be set to the center of the tuning range, 17.7 MHz, by adjusting L8's slug. L9 should then be adjusted for maximum injection into U1 pin 8, which should be around 0.5 V_{rms}. Adjust T3 for maximum second local oscillator injection into U4 pin 8, again around 0.5 V_{rms}. BFO frequency is centered by setting the two BFO range trimpots to their maximum values, centering the BFO tune control, and adjusting L7 so the signal at U7 pin 7 is at 455 kHz. The voltage at the wiper of the BFO tune control now corresponds to 455 kHz. The trimpots are then adjusted to give the desired range (say, 1500 Hz) on either side of 455 kHz.

Attach the signal generator to the antenna terminals and insert a 1 mV 7 MHz signal, reducing signal level as you proceed with alignment and overall gain increases. You should be able to find this signal with the bandspread and bandset controls. Attach both the counter and voltmeter to the secondary of T1. Rock the bandspread back and forth and adjust T1 for peak voltage near 455 kHz. Proceed backward toward the antenna, adjusting L6, L5, L4, and L3 for peak signal. With the exception of L5, these are elements of low-Q tuned circuits. Adjustment will have very little effect and is not critical.

L1 and L2 establish the shape of the input filter. You may wish to peak both coils to favor a particular frequency, or adjust them so one peaks

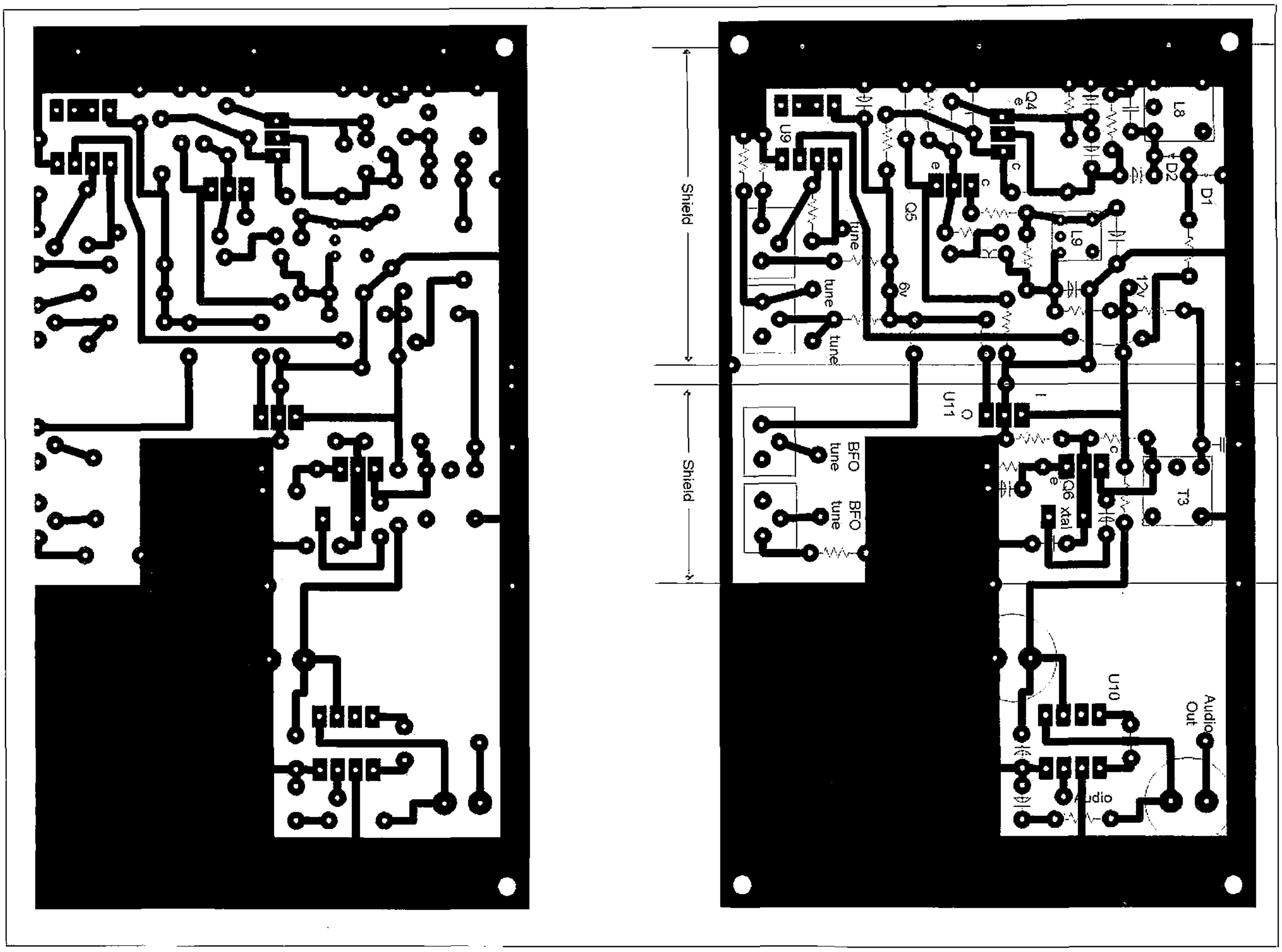

Fig. 5. (a) Oscillator board. (b) Parts layout from foil side.

below the center of the tuning range, and one above center, giving a flatter response.

Antenna

My unit was first tested on Field Day, so there were plenty of signals to practice with. Even with plenty of signals (and don't forget, lots of atmospheric noise), a short length of wire on the antenna will not suffice. At 16 feet of elevation, I have a dipole cut for 6.5 MHz, and a 75-foot random wire. Both these antennas, plus a cold water pipe ground, worked well.

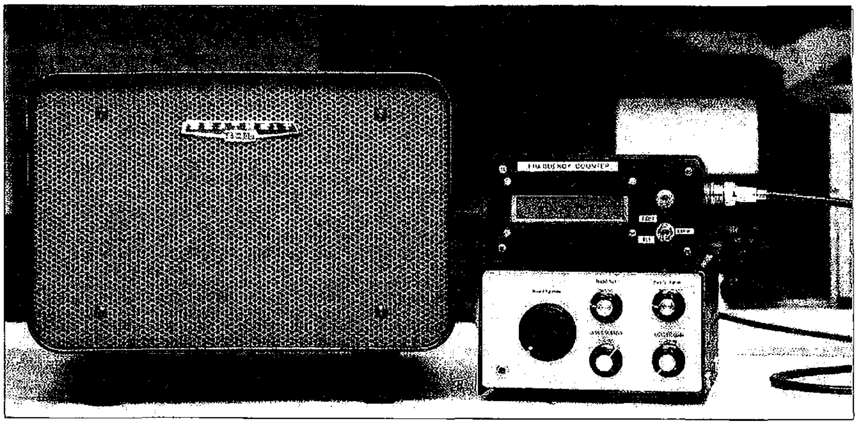

***Photo A**. Receiver shown with frequency counter and speaker. Note how the speaker, which normally accompanies my Heathkit SB-310 receiver, dwarfs both the radio and frequency counter.*

Operation

The bandset control can tune AM signals by itself if you have patience, but then that's what the bandspread control is for. I have my bandspread span trimpot adjusted to give about 80 kHz/revolution, which is fine for AM. Decrease bandspread span resistance, giving a smaller tuning range, if you concentrate on CW and SSB. When the BFO is on, set the BFO tune pot to center and locate the signal, then adjust for the desired sideband and audio quality.

I generally set audio gain to about one-third, turn on AGC, and use the IF gain control (which functions even with AGC on) to adjust overall gain. The AGC responds to severe atmospheric noise in an annoying way, so in

that case I turn it off. There is plenty of overall gain, and enough audio to drive a speaker quite nicely.

Modifications

If you adhere to my "use the junk box" rule, you may wish to change the circuit to match your own hoard of parts. The first local oscillator, for example, could use a nice vernier-driven variable capacitor in lieu of the

Parts List

D1, D2	MV209 29 pF varactor
D3, D4	MVAM108 500 pF varactor
D5	1N34A germanium diode
D6, D7	1N914 silicon diode
FL1	10.7 MHz ceramic filter, 230 kHz bandwidth
FL2	455 kHz ceramic filter
L1, L2, L8	1.5 µH slug tuned
L3	2.2 µH slug tuned
L4	15 µH slug tuned
L5	8.2 µH slug tuned
L6	120 µH slug tuned
L7	150 µH slug tuned
L9	1.8 µH slug tuned
T1	455 kHz IF transformer
T2	13 trifilar twisted turns on FT-37-77 core
T3	10.7 MHz IF transformer
U2, U5	MAR-1 MMIC wideband amplifier
U1, U4	SBL-1 double balanced mixer
U3, U6	MC1350 RF/IF amplifier
U7	NE602A mixer/oscillator
U8, U9	LM1458 dual op amp
U10	LM386 audio amplifier
U11	78L62 low power +6 V regulator
U12	7806 +6 V regulator

Table 1. Parts list.

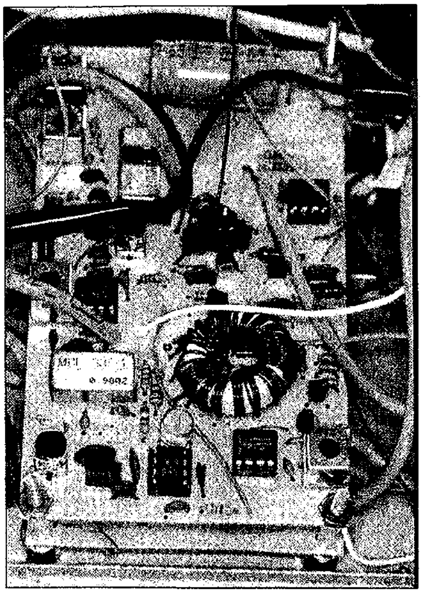

***Photo B.** Inside view. Large toroid is T2.*

varactors, thereby entirely eliminating U9 and the bandset control. The same is true for the BFO. Both these modifications would improve frequency stability, which is a little wild for the

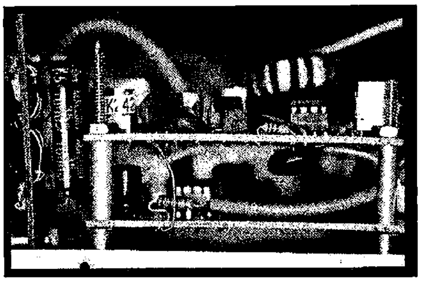

***Photo C.** Inside view showing stacked PC boards and power supply perfboard.*

first couple of minutes, but very solid thereafter.

There is enough space on the front end board to accommodate all of OH2GF's demodulator. The biggest component, T2, is already there. The SWL in particular should read OH2GF's article cited above before going ahead with the whole circuit or an AM-only version. Don't plagiarize my excuse about not being able to find an NE604!

L3, L4/C1, and L6 are impedance matching components. The circuit has sufficient gain that these components can probably be eliminated entirely. The π-section filter using L9 should not be removed, though: U1 and U4 like to see 50 Ω at each port. Speaking of filters, replacing the front end filter with one centered on 28.4 MHz would allow the low end of 10 meters to be tuned, with the first local oscillator used as is, but tuning on the low side. A single-stage RF amplifier might be needed to get the noise figure to a reasonable level.

There is only one second IF bandwidth: 6 kHz, determined by FL2. This is fine for AM, but a little wide for SSB and very wide for CW. An audio bandpass filter could be built from another op amp, and U9 has a spare section that could be used for this purpose. 73

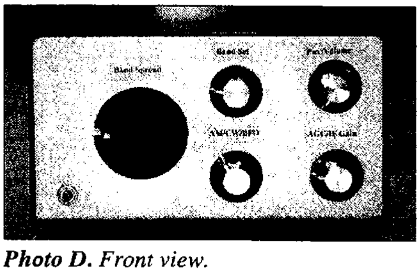

***Photo D.** Front view.*

LM- and BC-221 Frequency Multiplier

Generate detectable signals up to 1000 MHz.

Hugh Wells W6WTU
1411 18th Street
Manhattan Beach CA 90266-4025

Hams have the advantage and privilege of being able to design, build, test, and operate equipment in the ham bands; these privileges come with the passing of the ham license examination. The ham license is a "license to learn," and provides the incentive to get involved with electronic equipment and circuits. A large abundance of equipment has been developed over the years since the 1930s, with a large portion of it built for World War II. Out of that equipment inventory, and of specific interest to hams, are the LM- and BC-221 frequency meters.

These measurement instruments have been superseded by counters and phase-locked loop signal generators, but the usefulness of the old frequency meter still abounds. LM- and BC-221 frequency meters are showing up at swap meets for dirt cheap prices, making them readily available for the experimenter and his applications. The LM- and BC-221 are really precision measuring instruments that had an original frequency measurement accuracy of 0.01%—some may still be that good today. Without attention over the years their accuracy may have degraded some, but the usefulness of the instruments has not. These instruments retain their short-term stability and also have a long-term stability exceeding that of most of the currently available self-excited signal sources. My point is that each of these instruments should be given a second chance as a viable piece of test equipment.

Ham ingenuity is required to find new uses and applications for desirable equipment. One such application for old frequency meters is to use them as stable frequency sources capable of generating signals up to at least 450 MHz, with some detectable signal up to 1000 MHz. The fundamental tuning ranges for these two instruments are typically 125–250 kHz and 2–4 MHz in two bands. In its original condition, the frequency meter provided suitable harmonics up to at least 20 MHz from the 2–4 MHz band. To utilize the 2–4 MHz range for use in the VHF and UHF region, it is necessary to build a frequency multiplier capable of providing some usable energy at harmonic multiples up to at least 250 times (333 times for 1000 MHz) the fundamental frequency.

There are many designs and techniques available for frequency multiplication applications; the duty of the experimenter is to find a better solution to the problem to meet his requirements. As the saying goes, "the design is never finished until the last experimenter is dead," and that's true for the frequency multiplier circuit presented here. Electronic circuits are presentations of ideas for project solutions, and for this project as well as others, experimenters are encouraged to use, modify, and change the circuit as deemed necessary to meet their application needs.

The circuit

The objective of the frequency multiplier circuit is to increase both the signal amplitude and the harmonic content of the output signal such that the signal can be detected well up into the UHF range. Some of the available frequency multiplier circuit designs and other solutions are elaborate and complex, and may use parts not readily available to the experimenter. Therefore, a simple and repeatable design was sought, one which used older available parts that would be easy to assemble.

That objective was met and is shown in **Fig. 1,** where the parts are an

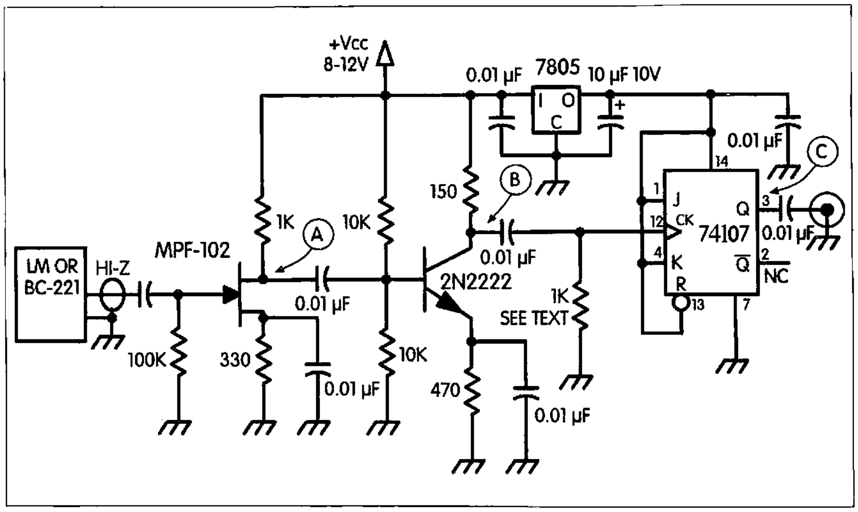

Fig. 1. Frequency multiplier circuit that extends the LM- or BC-221 frequency output up into the UHF range.

MPF102 JFET, 2N2222 transistor, 74107 J-K flip-flop, and 7805 (LM340-5) voltage regulator. A CMOS 4027 was tried as an alternate for the 74107, but it failed to toggle for whatever reason. The purpose of trying the 4027 was to take advantage of the higher VCC voltage tolerance. Also, selecting the 74107 part required the use of the five-volt regulator. Should a 74107 part not be available, the following parts may be considered for substitution: 7473, 74LS78, 74276, 74376, and 74F112 (the 54XX series should also work satisfactorily in this application). In any case, only one section of the chip is used for the multiplier. The remaining input pins must be grounded while the outputs are allowed to float.

An FET is used as an input stage to accommodate the high output impedance of the frequency meter. Because of the high impedance, a flexible shielded cable, such as coax, should be used to reduce extraneous signal pickup. Any length less than about four feet is suggested in order to keep down the capacitive load on the frequency meter's output circuit. Attachment to the meter is accomplished by drilling a small hole in the case near the RF terminal for a small self-tapping screw, which is used for holding a solder lug as shown in **Fig. 2**. The FET and transistor stages provide sufficient signal amplitude, though marginal, to toggle the clock input of the 74107. The resistor connected from the 74107 pin 12 to ground deserves special attention. It is necessary to select a value for this resistor which allows the clock signal to swing sufficiently above and below the "maybe" region, because the resistor establishes the DC reference level for the chip input. A 1 k resistor satisfied the requirement for the prototype circuit but may need to be adjusted slightly to accommodate a different 74107 or one of its substitutes.

Circuit waveforms

Fig. 3 shows the signal waveforms obtained at three points within the circuit; it may be used as a guide in building the frequency multiplier. Waveform A is nearly a sine wave at the drain terminal of the MPF102. The 2N2222 reshapes the waveform to a near pulse as shown in B. As expected

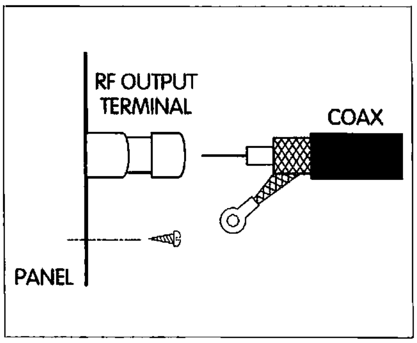

Fig. 2. Coax attachment. Small hole drilled for self-tapping screw which is used to ground the coax shield.

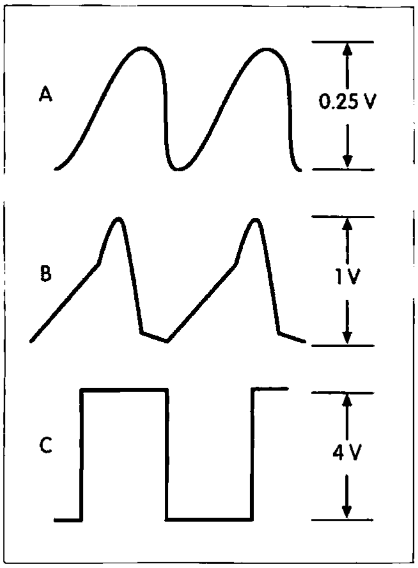

*Fig. 3. Waveforms obtained at points A, B, and C as indicated in **Fig. 1**. Voltage values are approximate.*

and desired, the waveform at C is nearly a square wave. A pure square wave would contain only odd harmonic energy of the fundamental. But sufficient distortion is present in the output of the 74107 to provide energy at both odd and even harmonics of the fundamental.

To understand the signal output characteristics, signal levels at various frequencies were measured. A curve was drawn between the points, as shown in **Fig. 4**, to show a general amplitude profile. The measurements were made using a 3 MHz signal from the frequency meter and the amplitude was measured at the indicated frequencies. At 450 MHz (150th harmonic), the signal was detected at a level of 0.1 µV. At 300 MHz, the signal rose to 0.3 mV. Judging from the test data, the frequency meter and multiplier combination is usable as a signal source up into the 450 MHz band (although marginal above 450). A signal was detected as high as 1000 MHz (333rd harmonic), but the amplitude may be useful depending upon the sensitivity of the receiver. No attempt was made to determine if a signal could be detected above 1000 MHz, but it is reasoned that some detectable signal is likely. The length of the coax between the multiplier and receiver greatly affected the detectable signal level, with short cable lengths being preferred. For measurement results shown in **Fig. 4**, the coax was six feet of RG-58.

While monitoring at 450 MHz, the source frequency was manually swept from 2 to 4 MHz to determine which frequency might produce the highest amplitude. I found that frequencies in the range of 3.4 to 3.8 MHz produced a higher amplitude, approaching 10 µV. The amplitude variance shown in the curve is a function of the distortion in

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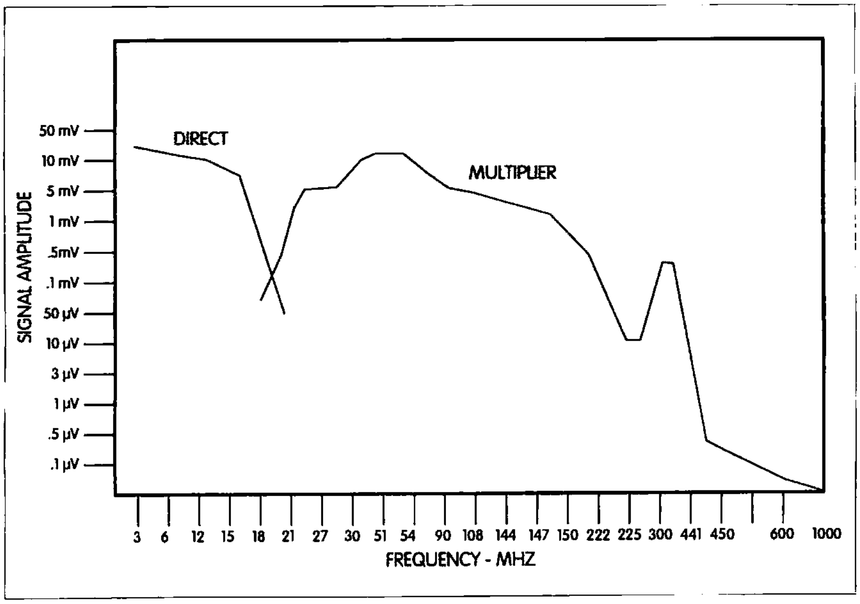

Fig. 4. Typical signal amplitude vs. frequency.

LM- and BC-221 Frequency Multiplier

continued from page 19

the 74107's output waveform as well as the harmonic number.

Different chips might exhibit a different set of energy levels at the indicated harmonic, but the general profile would be expected to remain. Should a spectrum analyzer be used to view the output of the multiplier, it would display a comb of signals, each separated by the frequency of the source. The amplitude of the comb display would follow the curves shown in **Fig. 4**.

No attempt was made to include a resonator at the desired output frequency. However, the addition of a resonator would improve the amplitude of the signal present at the frequency of resonance. Conceivably, the use of a resonator following the multiplier might create usable signals in the 900–1296 MHz bands. An experiment to prove the validity of the scheme is warranted. A suitable resonator could be made using a stripline, cavity, or coil and capacitor. The higher-Q stripline and cavity are recommended to better the chances of success.

Construction

Construction of the multiplier circuit is simple and noncritical. Common parts were selected for the project; they may be mounted using any desirable method—from the "dead bug" style to a printed circuit board.

The resistors used in the project may be from 1/8 to 1/2 W, but the board layout I used (not shown; you can easily make your own) accommodated 1/4 W ones. All of the coupling and bypass capacitors, except C8, were 0.01 µf disc ceramics. But any value from 0.005 µF to 0.1 µF is satisfactory and may be used in any combination of availability.

Conclusion

The LM- and BC-221 frequency meters were built as quality and precision measuring instruments. That quality has probably been retained over the years. I suggest that you salvage these instruments from their resting places on dusty shelves and the chopping blocks at swap meets.

Build the frequency multiplier circuit and bring your instrument back to life as an accurate and stable signal source capable of generating signals as high up as 1000 MHz. As indicated by this experimental project, everything is simple and non-complex, yet the project achieves reasonable results in terms of frequency multiplication.

Don't be afraid to change and/or modify the circuit in any way you like. The fun of a project is to experiment with different values, parts, and concepts to achieve a useful result.

Parts List

R1	100 k 1/4 W resistor Jameco #29997
R2, R8	1 k 1/4 W resistor Jameco #29663
R3	330 1/4 W resistor Jameco #30867
R4, R5	10 k 1/4 W resistor Jameco #29911
R6	470 1/4 W resistor Jameco #31165
R7	150 1/4 W resistor Jameco #30162
C1, C2, C3, C4, C5, C6, C7, C9	0.01 µF disc cap 50–100 V Jameco #15229, Hosfelt #15-888
C8	10 µF 16 V radial cap Jameco #94211, Hosfelt #15-853
Q1	MPF102 JFET transistor Jameco #26403, NTE213
Q2	2N2222 NPN transistor Jameco #28628, #38236 NTE123A
U1	LM340-5 5 V regulator Jameco #51262, Hosfelt #7805
U2	74107 JK flip-flop Jameco #49234, Hosfelt #74LS107

Table 1. Parts list.

The Ultra-Simple 20

The simplest solution to any problem is the best ...

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Slough SL2 1DA
England

And they don't come much simpler than this 20-meter band transmitting antenna. It has been used, off and on, for 20 meter CW activities over the last 30 years—or more, starting at a time when occupational activities necessitated quite frequent moves of QTH. One of those moves meant being located in Minnesota for several years, in the 1970s.

The antenna can be used indoors or in a very restricted space outdoors. It can also be put up in a hotel room, used portable, on vacation, or as an extra "occasional" antenna. The design is low cost—the antenna needs a bare minimum of parts: just some wire, some fishing line and a good variable capacitor.

Simplicity itself

The base impedance of a λ/4 vertical antenna wire is usually between 20 and 30 ohms, depending on the grounding system—not 50 ohms, as is often assumed. For 50 ohms it will require some kind of matching device. However, if the antenna is lengthened to λ/3, then the impedance will have increased to 75 ohms, which is a common feedline impedance. But, as the length and impedance have increased, so has the inductive reactance, which will have to be reduced with a series capacitor.

As the antenna was designed for 20 meter CW operation, it was initially cut so that it happily covered from 14,000 kHz to well over 14,100 kHz. The output impedance of the transmitters that have been used with this antenna was 75 ohms. The usual transmit power has been up to about 10 to 25 watts, though 100 watts *was* used in Minnesota in the 1970s.

The simple design is shown in **Fig. 1**. It consists of 23 feet of wire, supported by nylon fishing line, which also acts as end insulation. A series variable capacitor (VC) is used to tune out the reactance. The variable used was a 60 pF, though 100 pF could be used. This variable should be a good-quality small transmitting type, though a wide-spaced, well-insulated, receiving type could be used up to about 20 watts. As it is at a high voltage point, it should be enclosed in a small plastic

Continued on page 22

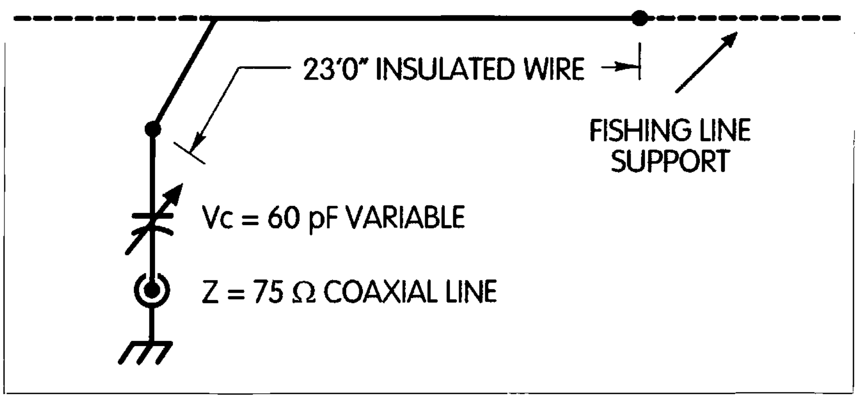

Fig. 1. 20-meter antenna.

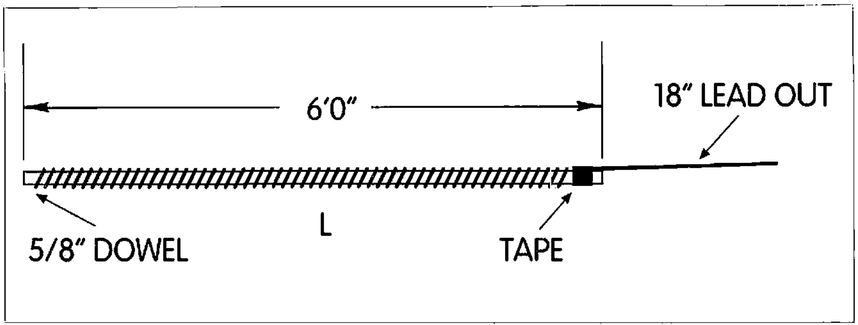

Fig. 2. Optional "artificial" ground. Wire windings are half an inch apart on the dowel.

The Ultra-Simple 20
continued from page 21

box, for safety and dust protection, and fitted with a short insulated shaft.

A good ground is essential, and the ground lead should be as short as possible. Using, say, a 12-foot length of wire to a water pipe could introduce all kinds of problems, as it would be over λ/8 long at 14 MHz!

Quick and slick

In the typical installation shown in **Fig. 1**, the antenna length of 23 feet represents λ/3 at 14,030 kHz. This frequency was selected from experience, on the basis that though the electrical length might change somewhat (if the antenna was bent somewhat or erected horizontally or sloping), it could still be used in the CW spectrum, 14,000–14,100 kHz or more. Past experience shows that this has held good, in various installations, in various places.

Fig. 1 is an in-room layout, with the antenna running diagonally across the room. The far end is supported by monofilament fishing line. The other end drops down for (typically) four feet, to the variable capacitor (VC) and transmitter. The angle of the bend should be much more than 90°, and supported with fishing line, as shown. A 90° bend should be avoided.

The transmitter end of the antenna goes to a good-quality variable capacitor, which should be mounted in a plastic box. An insulated shaft, with coupler, should be between VC and control knob.

The coaxial socket is also mounted in this box, and the outer conductor should be connected to a good ground, with a short lead (more on this later).

The suggested antenna wire is 20-gauge stranded PVC-covered. If the antenna is erected outdoors, this wire should be examined every few months, as extremes of temperature may cause the PVC covering to deteriorate. Also, strong braided fishing line should be used to combat winds and storms.

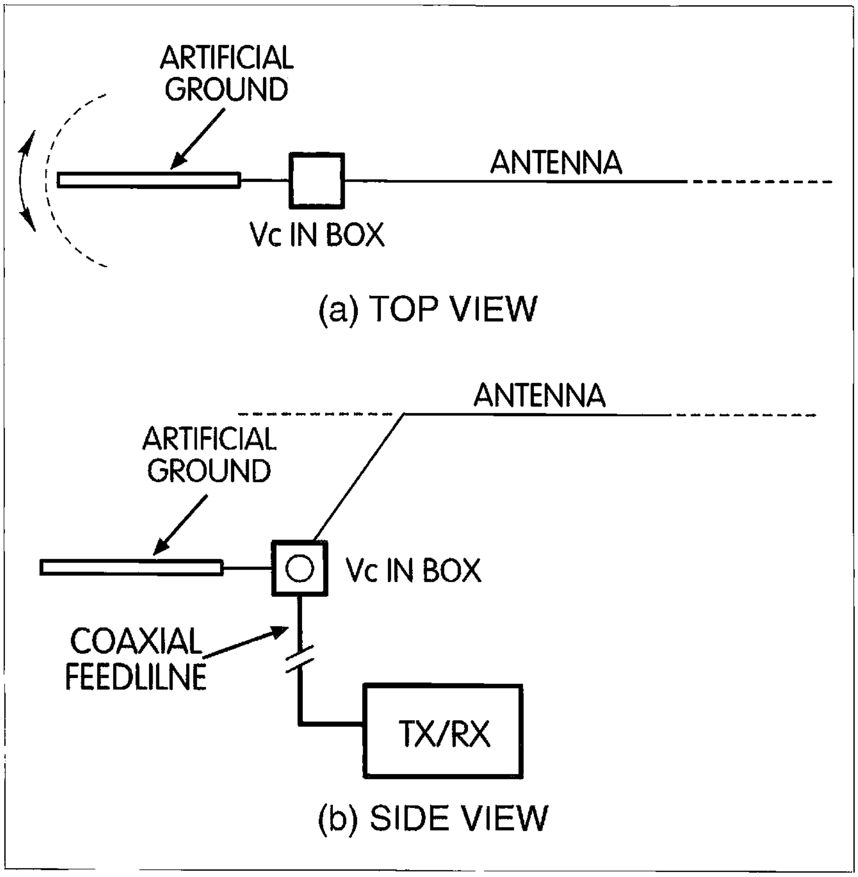

Fig. 3. Orientation of artificial ground.

Grounding alternatives

The ground connection lead should be as short as possible, and certainly not exceeding four or five feet. It can be taken to a convenient *metal* water pipe, if this exists. But make certain that the pipe is at ground potential!

An alternative ground used has been a λ/4-wave wire dropped out of a window, when required, with VC (in box) mounted just inside the bottom edge of the window frame.

Another successful ground was a metal frame window about 16 feet wide. The VC box was mounted on the wall, near a top corner of the window frame, and a six-inch lead clipped to the metal frame. The coaxial feedline dropped down to the transmitter, which was located directly below on a table. The antenna ran diagonally across the room. The same setup also worked well with an antenna outdoors in a very confined space.

You can see that the grounding technique used will depend on the prevailing circumstances, and may

require some individual initiative and experimentation.

An "artificial" ground

A popular "artificial ground" is shown in **Fig. 2**. It consists of 36 feet of 20-gauge stranded PVC-covered wire, wound on a 5/8-inch diameter wood dowel, or plastic tube. The wire turns should be spaced half an inch apart. The wire is extended by a further 18 inches to form a connecting lead.

The artificial ground has been particularly successful, and used at several QTHs. With a little practice it is easy to set up.

Fig. 3b shows this "ground" erected behind, and in line with, the antenna. Indoors, it should be mounted well clear of walls (hidden house wiring and pipes) and at least 30 inches above floor level. Top view (**Fig. 3a**) shows it in line with the antenna. However, it can be oriented up to 90° either way, to obtain the best loading, and to neutralize the effects of surrounding objects—hidden or otherwise.

It's a personal choice

I personally consider this antenna to be a low-power device, using up to 25 watts. No doubt it could be upgraded by individual operators using a more robust higher-voltage variable capacitor (VC) and ceramic insulators to replace the fishing line technique. However, with 15 watts low power CW, it has been found to be quite adequate. It has not been used higher up the band with SSB, and possibly this would mean a small amount of antenna length pruning. The antenna should be connected to the rig with 75-ohm coaxial feedline via a low-pass filter.

First, tune the receiver to 14,030 kHz and rotate VC for maximum signal. Recheck at 14,000 and 14,100 kHz—the VC should not need retuning.

Again, at 14,030 kHz, feed low transmit power into the antenna, and slightly rotate VC (if required) for maximum radiated signal on a nearby field strength meter. A check should be made that harmonic radiation is not occurring. Readjust VC to eliminate if needed. Recheck again at 14,000 and 14,100 kHz, and gradually move up the band to find the maximum usable frequency. If a portable TV is available, then place it under, or near, the antenna, as a simple practical TVI check.

If TVI should occur, (1) check and experiment with the ground system and (2) ensure that the antenna is clear of house wiring, which may be hidden. On one occasion when used with a 50-ohm transmitter, an existing "T" ATU was inserted into the coaxial line, as a simple quick means of matching the 50-ohm transmitter to the 75-ohm antenna. This also proved to be a most effective eliminator of TVI.

The basic concept is very simple. No doubt individual experimenters can produce variations to suit particular circumstances. Quickly assembled and erected nearly anywhere, the simple design lends itself to very confined space situations—and to almost any ham's needs! 73

The Franklin VFO

A nifty chill-chasing project for the serious home-brewer.

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The Franklin oscillator circuit makes a terrific frequency control for ham transceivers, transmitters and receivers. It is inherently stable because only the tuning tank circuit controls the oscillating frequency. Band-switching is very simple because the L/C circuit is in parallel, with one end grounded.

The Franklin oscillator is unique in that the capacitors and resistors in the oscillator circuit are not frequency-determining components. The values of the internal NPO capacitors remain the same without regard to the frequency being generated—it's a truly universal VFO circuit.

Although this oscillator requires using two JFET transistors, the actual oscillator contains only four NPO capacitors and four resistors, which remain the same regardless of frequency. There are no critical parts, no tapped coils, and no capacitive voltage dividers to provide feedback.

The tuning capacitor and its parallel inductance, plus any necessary padder and trimmer capacitors, must be of the highest quality because they are the only frequency-determining components. They also contribute to the inherent stability. The main tuning capacitor should have a ceramic frame, be double-bearing, and have plated, soldered-in brass plates. As it is relatively large, its thermal inertia adds greatly to the frequency stability.

Any variable capacitors used as trimmers or padders should preferably be air-dielectric type, although ceramic NPO trimmers are almost as good. Of course, fixed padding capacitors must be NPO ceramic-disc types of the largest diameter you can find. Because the capacitors are heated by the RF current flowing through them, the total amount of padding should be divided among several smaller-value capacitors, and the large-diameter ones can provide additional area and keep RF heating-induced instability minimal. This is not the place to use tiny monolithic COG type capacitors!

The coil used is equally important. The best would be a solidly-mounted air-wound coil such as the B&W Miniductor® series, but you may be unable to find them (hamfests and swap meets are a possible source). Almost as good is a coil wound on a hollow ceramic form of a diameter which allows close to a 1:1 ratio (diameter to length) for the needed inductance. This will provide the highest "Q." There must be no slug in the coil form.

Most of us hard-core home-brewers will end up winding our coils on iron powder toroid cores. The Amidon® Mix-7 is a good choice. The T68-7 has an AL of 50, and Mix-7 has a temperature coefficient of 30 ppm/°C, the most stable mix available today. The T50-7 has an AL of 43 if a smaller core is desired. However, the larger T68-7 core has a greater thermal inertia, and aids long-term stability.

The JFETs you choose should be of high quality, though they don't need to be expensive. Although MPF102s will generally oscillate in this circuit, they are not recommended. Among the recommended JFETs are 2N4416, 2N5486, U310, J308, J309 and J310. Other JFETs with a transconductance of 4000 or more will also be suitable *if* they have a maximum frequency rating of 300 MHz or higher. The two JFETs (Q1 and Q2) in the actual oscillator must be the same type number but they don't have to be perfectly matched.

As in any VFO, the oscillator must be isolated from the load. Normally,

this requires another JFET as a source follower, followed by a bipolar NPN Class A amplifier.

Here's what it looks like

The schematic diagram of the Franklin VFO is shown in **Fig. 1**. The components and values specified provide a stable range of 5.0 to 5.5 MHz, perhaps the most widely used VFO frequency. Changing the oscillator to cover other frequency ranges is discussed later in this article.

Operation of the oscillator, Q1 and Q2, and associated components is unusual—I don't know of any other VFO circuit like it. The four resistors, R1 through R4, establish operating conditions and the oscillator and source follower are powered with a regulated +9 V supplied by U1. The tank circuit (C11 and L1, and the parallel connected trimmer and padder capacitors, C12 through C16) is very lightly coupled to the oscillator at the junction of C1 and C2, which are very small capacitors. This essentially isolates the frequency-determining components from the oscillator and prevents loading the tank circuit, maintaining circuit "Q." C1 and C2, in conjunction with C3, cross-connect Q1 and Q2 similarly to connections used in an astable multivibrator. Thus, the Franklin oscillator is foolproof—it *has* to oscillate!

When power is applied, the slightly different transistor characteristics cause a tiny difference in current flow through the drain resistors, and this starts oscillation, which is maintained by the cross-connections of C1, C2, and C3, with frequency being controlled solely by the components connected between the junction of C1 and C2, and ground.

RF from the drain of Q2 is fed through C4 to the gate of source follower Q3. Output from Q3 is taken across RFC1 and fed through C7 to the base of Q4, an NPN bipolar Class A amplifier, which amplifies the RF and provides it through C10 to the following circuit being driven by the VFO—normally a transceiver, transmitter or receiver.

Continued on page 26

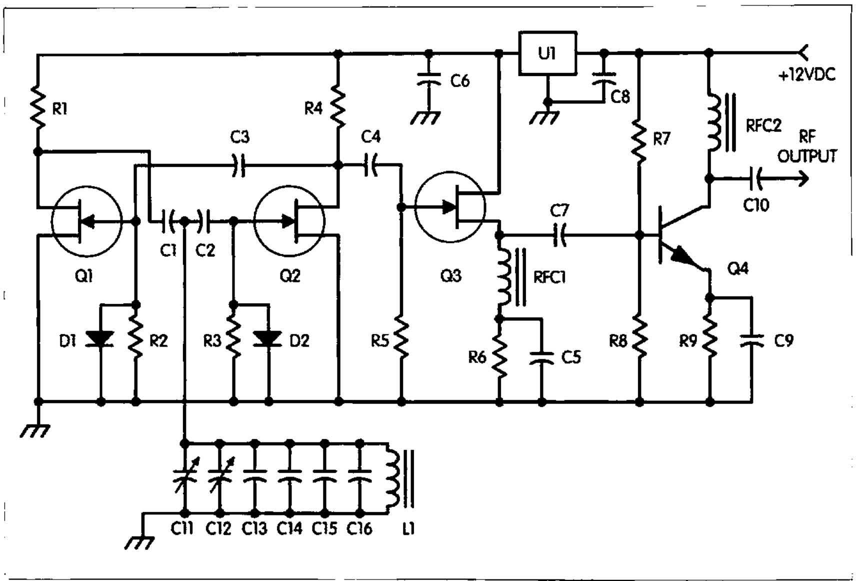

Fig. 1. Franklin VFO schematic diagram.

The Franklin VFO

continued from page 25

Here's how to build it

Mechanical stability is of the utmost importance for all components. The VFO should he constructed in a shielded enclosure, either aluminum or one made from double-sided printed circuit board material with soldered seams. The main tuning capacitor should be mounted through the front of the enclosure. An access hole must be drilled for tuning access to trimmer C12 so it can be adjusted from outside the enclosure. However, if an air-dielectric capacitor is installed at C12, it will mount through the top or side of the enclosure as well.

Although a single-sided glass epoxy printed circuit board could be etched and drilled for the VFO circuit, going "dead bug" style with point-to-point construction is often better, with short leads, and the transistors and L1 epoxied in place. All ground connections are made directly to the ground plane. Because tiny monolithic COG capacitors are specified for C1 through C4, little space is needed. Besides, the circuit will be completely hidden inside the enclosure and no one will see the "ugly" construction.

Use solid bare wire for the connections between C11 and C12, and from C11 to the junction of C1 and C2. Rotors of both capacitors should be connected to the ground plane with bare wire as well. Capacitors C13 through C16 can be connected with short leads across C11 or C12 or both.

Because C11 tunes from 5.0 to 5.5 MHz in 180 degrees of rotation, use a vernier mechanism to slow the tuning rate when using the VFO. They're often difficult to locate, and generally costly when you do find them. As this is written, Jackson Brothers' ball drives, 7:1 and 10:1, are available from Dan's Small Parts and Kits, Box 3634, Missoula MT 59806-3634, $13.50 and $15.00 respectively.

Similar vernier mechanisms may be salvaged from old Eico, Knight and Heathkit test equipment. National Radio "Velvet Vernier" mechanisms, although about two inches in diameter, can be salvaged from World War II-vintage military radio tuning units used with the BC-191 and BC-375 radio sets. These units tune very smoothly, but about the only places to find them nowadays is in old-timers' deep junk boxes.

There are also Japanese vernier dials, in two small diameters, which are available from a few mail-order dealers. These are not as smooth tuning as the Jackson Brothers' or Velvet Vernier mechanisms. Cost will probably be under $15.00.

Here's how to use it

Normally, adjusting C12 will center the frequency range of the VFO to cover the desired span. However, because of unavoidable stray capacities and component tolerances, including the winding of L1 and the core properties, it may be necessary to shift the tuning range up or down a small

Parts List

C1, C2	10, 12 or 15 pF COG or NPO. Must be same value.
C3, C4	100 pF COG monolithic
C5, C6, C8, C9	0.1 µF monolithic
C7, C10	56 pF NPO or COG
C11	50 pF air dielectric, double-bearing (see text)
C12	50 pF air dielectric or NPO ceramic trimmer
C13	30 pF NPO disc ceramic, largest diam. available
C14, C15, C16	33 pF NPO disc ceramic, largest diam. available
D1, D2	1N914, 1N4148 or equivalent
L1	T68-7, 35T #24 or #26 enamel wire
Q1, Q2, Q3	2N4416, 2N5486, U310, J308, J309 or J310 (see text; Q1, Q2 must be same type)
Q4	NPN 2N2222, 2N4400, 2N4401 or equivalent
R1, R4	1 k 5% 1/4 W
R2, R3, R5	1 meg 5% 1/4 W
R6, R9	100Ω 5% 1/4 W
R7	15 k 5% 1/4 W
R8	5.6 k 5% 1/4 W
RFC1, RFC2	390 µH (100 to 1000 µH suitable)
U1	78L09 voltage regulator

Table 1. Parts list.

amount. Adding or removing a turn or two from L1 and readjusting C12 is the easiest way to manage this. The tuning range may also be a bit short or a bit long, in which case more or less NPO padding capacity may be needed. When the frequency has been adjusted as necessary, be sure to put two coats of Q-Dope® or clear fingernail polish on the winding of LI, both to keep the winding from shifting, and to prevent moisture from changing the inductance.

Here's another way

Because the tank circuit and associated capacitors are the sole determinants of frequency, it will be easy to tailor the Franklin VFO to cover other frequency ranges, by substituting other values for the components specified. To restrict the tuning range, a fixed NPO or a variable air-dielectric capacitor can be placed in series between C11 and the junction of C1 and C2. Reducing the value of the capacitor used at C11 will also reduce the tuning span.

Here's what I think

The Franklin oscillator will happily oscillate just about anywhere you want it to. I have had a Franklin tossed together on a protoboard oscillating at over 30 MHz, but because of the long leads to the coil and tuning capacitor, I can't say how stable it would be. In my case it varied over several hundred hertz, but if it were solidly constructed and shielded properly, it probably would have proven to be much more stable. Certainly it would be far better than the Hartley, Clapp or Colpitts oscillators at these high frequencies.

I am currently working on the design of a band-switched HF signal generator based on the Franklin oscillator circuit, and if it proves to be as good as I think it will be, you may see the signal generator described in these pages in a few months.

I first stumbled across the Franklin oscillator in a forgotten publication more than 15 years ago, and have been intrigued by its possibilities ever since. I've built a number of them for experiments over the years, and have been quite impressed at their inherent stability, even though in most cases I built them from odds and ends out of the junk box. Though I've never learned the Franklin oscillator's provenance, I can't understand why such a simple, stable circuit hasn't had more exposure in the ham literature. Perhaps this article will give it a well-deserved boost. 73

The IC-706MKII Shack-in-a-Box

Take another look at an increasingly popular rig.

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When I first started out in amateur radio, I had a large GI-style green metal desk covered with ham equipment. More equipment was on a set of shelves that sat beside my chair. This setup made up my station and allowed me to operate HF on AM, SSB, and CW; six meters on AM; and two meters on AM.

Let's move ahead about 30 years and take a look at modern hamming. I now have a little solid state rig that allows me to operate 160 meters through two meters on AM, FM, CW, RTTY, and SSB. It is about the size of a cigar box. What is this diminutive device? It's the ICOM IC-706MKII. The MKII is the second in the IC-706 series, and has been available for about a year or so.

I have had my MKII for about 10 months, and have used it as a portable in my travel trailer and fixed in my shack. It is the latter operation that has proved so impressive. I have yet to use all the available features, but have been able to make many comparisons with my regular station equipment lineup.

The reason for this article is to give you a user's point of view and checkout of the IC-706MKII. I hope to assist you in being able to make an informed decision regarding the purchase of an MKII, which at the time of this writing was selling for about a kilobuck—due no doubt to ICOM's announcement of the IC-706MKIIG, which will include the 440 MHz band.

Open the box

The MKII is packed in a box not much larger than a shoebox. Stock equipment consists of a hand mike, power cable (for 12 VDC), some plugs, spare fuses, and an instruction manual. The manual you will find of absolute value—in fact, you cannot operate the radio without it. The hand mike is another story—I found it to be of *no* value, not even as a paperweight (more on this later).

Connect the rig to 12 VDC and an antenna. You're on the air! Well, almost. Better get that manual out, because in the beginning you will be needing it—but not for long.

Menu-driven

Much of the operation and all of the basic setup of the MKII is by menu selections. Like the most recent VHF/UHF HTs and GPS (Global Positioning System) receivers, you choose features and operations via main menus and submenus, making selections from five push-buttons. Sound complicated? Yes! Complicated to use? No! It just takes some time to learn the various menus and how to switch between them. Note that most of the menus are only used for initial setup or on rare occasions. During normal operation I select between two menus, just for switching to the narrow SSB filter or to toggle the DSP. All else pretty much stays the same.

Compare

How does the little rig compare to my other rigs? Well, first of all, the 706MKII is not easily compared to any other rig, as it is far more capable than most. This rig does HF, six meters, and two meters. For this article, I will look primarily at HF and then comment about six and two meters.

My HF mainstay is a Yaesu FT-990 with a Timewave DSP-59Y outboard filter. I think I have been able to fairly compare the MKII to the 990 by using an A/B switch arrangement. Both rigs feed identical bookshelf-style speakers.

The receiver

The ICOM 706 MKII is a very comfortable receiver to listen to. It is exceptionally quiet and very stable (an optional CR-502 high stability crystal unit is available). The rig covers 30 kHz through 199.999 MHz in all

modes. I have used it for listening to AM broadcast, shortwave, the local sheriff, and even country music [using wideband FM (WFM)].

The MKII's sensitivity is great. As with most current rigs, it's greater than what natural conditions (QRN) allow. I have noted, however, that it is outstanding at hearing weak signals on 10 meters.

Selectivity, in most instances, is excellent. The IF shift works very well and the optional SSB 1.9 kHz narrow filter (FL-223) is a very worthwhile investment. To say the optional DSP unit (UT-106) is great would be a very large understatement. The DSP is super! The NR (noise reduction) portion of the UT-106 outperforms my Timewave and the ANF (automatic notch filter) is very effective.

However, I have noticed that at times nearby strong SSB signals will cause some interference to be heard from as far away as ±6 kHz (for example, when the signal you are listening to is an S7 and a powerful signal 6 kHz away is 30 dB+). Using the 1.9 SSB filter will help, but to really combat the problem, turn the receive preamp off or use the attenuator. If the noise blanker is on, switch it off—it is a real contributor to this type of interference. This particular problem, and its solutions, are not unique to the MKII—most other rigs suffer from similar selectivity problems under like conditions.

Memories

"Thanks for memories" is the only phrase that can describe what the MKII's memory features can do. There are 99 operational memories (can be used for simplex or split operation), two scan edges (top and bottom), and a call channel (as found on many HTs).

The main memories store the frequency and all the parameters in use when programmed, such as mode, preamp, attenuation, and split operation settings. They are completely tunable, meaning you are not locked onto a memory's frequency or mode when selected. You can tune from it and then return with a simple click of the memory switch.

I use memories for everything from recalling my favorite nets to scanning the VHF bands.

The mike problem

The hand mike that comes with the MKII is designed to be noise canceling. In practice, I found it to be voice canceling. The signal reports I received were among the worst I have ever received with any rig/mike combination I have ever used. But the fix was easy!

I purchased an ICOM SM-6 desk mike and an adapter cable. The adapter cable (OPC-589) is necessary to go from the SM-6's standard round plug to the modular plug used by the MKII. This adapter cable is a requirement for using most optional ICOM mikes with the 706, except for the standard hand mike. In the future, ICOM will be offering a wider selection of mikes with modular plugs on them.

Was the solution expensive? Yes! The mike and cable cost me over $150, but it sure was worth it. The signal reports I now get are just like those I am accustomed to hearing when using my Yaesu FT-990—and those are great. Many ops who know my voice well say that they can tell no difference between the sounds of the two rigs. To me that is a great compliment for the ICOM.

I do not operate HF mobile—just portable and home—so I have no need for a hand mike. However, ICOM makes several hand mikes that should do well for mobile applications—in lieu of the stock mike.

External speaker

The audio coming from the 706 is very good, considering the size of the speaker (about three inches, from screw to screw). Great improvement can be made, however, by sending the audio to an external speaker.

In my shack, I use bookshelf-type wooden-cased speakers. As I mentioned previously, one is hooked to the FT-990 and another to the ICOM. Try this setup, and you won't be disappointed—no matter what rig you are using.

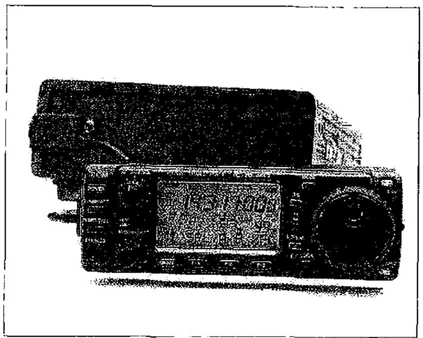

Photo A. ICOM's IC-706MKII.

When portable in the travel trailer I use a set of $10 Sony headphones (with a mini plug). They are very light, give great sound, and take little space.

Using an amplifier

Although there is an accessory socket on the rear of the 706, and a plug comes with it, the MKII has no provisions for directly keying an amplifier. Some form of solid state switch or mechanical relay interface must go between the 706 and the amplifier for keying. This is not a maybe—it is required! Direct connection to an amplifier's keying circuit will damage the MKII.

I use an Ameritron ARB-70212, which picks up its control voltages and signals from the accessory socket. In turn, it keys my amplifier. After initial wiring of the accessory plug, the operation has been flawless. You can construct a switchbox should you be averse to purchasing one.

Shack-in-a-box

To summarize, the ICOM 706MKII is a complete shack-in-a-box. It is an HF rig, a two meter multimode rig, a six meter multimode rig, a VHF scanner, an AM/FM broadcast receiver, and a great SWL receiver. Plus, it has an internal DSP unit. And look at the size of this rig—its cigar box size replaces a deskful of equipment.

Want to use even less space? Remove the front panel and hide the rig and power supply up to 16 feet away (requires optional separation cable).

Do I recommend the 706MKII to others? You bet!

Continued on page 54

Mods for the OHR 100A

Here's how to make a popular QRP rig even better.

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The Oak Hills Research Model OHR 100A monoband CW transceiver kit is extremely well designed, easy to build and align, and puts a solid five watts on the air. Unusual for a QRP rig, the 100A has five knobs on the panel: Tuning, Bandwidth, AF Gain, RIT, and RF Gain (actually, IF Gain).

The tuning range is in excess of 70 kHz. IF bandwidth can be varied from >1.1 kHz to <400 Hz. RIT is variable up and down >1.5 kHz. Two audio amplifiers are included: an LM380N-8 for phones, which drives an LM380 for an external speaker. The rig draws less than 90 mA on receive, and less than one ampere with five watts out using a +13.8 VDC supply. A drive control accessible from the rear deck allows reducing power down into the microwatt level.

The 100A includes a twin-T sine wave sidetone oscillator variable in frequency and level. Because I prefer sampling the RF output for sidetone (being congenitally unable to match two pitches), I considered changing the circuit to use the RF output for sidetone instead. Inspecting the schematic, I discovered not one but *three* receiver mute transistors—Q104, Q107, and Q111. I could not determine why such apparently redundant muting was deemed necessary, and I'm not about to try to second-guess Dick Witzke KE9KL, the designer, so this is one change I did not attempt.

However, by including an audio peak circuit and tuning for the loudest signal, I'm guaranteed to be transmitting into the center of the other ham's receive filter, and I don't have to match two pitches. More about this circuit later.

While most hams might not think much if anything would really be needed to make the 100A even better, I saw an opportunity to make this excellent kit into a superior one, much easier to use and practically idiotproof. It is now impossible to tune onto the wrong sideband. Noise is greatly reduced, and the minimum discernible signal (MDS) is dropped into the cellar. I am unable to measure MDS but it is considerably better than stock.

Because my kit is for 30 meters, I restricted the tuning range to approximately 32 kHz to cover just the CW portion of the band with a small overlap at each end. I also replaced the 10 k pot supplied for tuning with a Bourns 10 k 10-turn pot ($3.95 from Electronic Goldmine). Additionally, I built the K1MG LCD Dial/UTC Clock kit (available from Mike Gide K1MG, Blue Sky Engineering Company, 400 Blossom Hill Road, Los Gatos CA 95032, $29.95 plus $5.05 S/H, as this is written; prices may change in the future, so check before you order).

Although all the changes I made are described here, you are, of course, invited to pick and choose, incorporating only those changes you wish. At first glance it may seem that I gutted the rig—the final rig has but two knobs on the panel (Tuning and AF Gain), a push-button to activate the clock function of the LCD dial, and a toggle switch to insert or remove the peak circuit from the audio chain—I did not make any real circuit changes beyond those which can be duplicated by turning the Bandwidth and RF Gain (actually, IF Gain) controls fully clockwise. Both were mechanically programmed as if they were both clockwise because both had to be removed to make room for the LCD Dial/Clock.

There are two minor additions better made beneath the circuit board. There

is very little headroom beneath the board, about one quarter of an inch, so use care.

Solder a 4.7 µF tantalum capacitor between pin 8 (+) and pin 4 (-) of U107, an LM380N-8. Be sure there are no shorts. This may not be necessary, but it is generally recommended because it decouples the internal circuitry from the DC supply.

Locate the trace along the rear of the bottom of the circuit board which connects the center conductor (+) of the DC jack J104 and the center pin of P100. Cut this trace, and scrape the solder masking off a section on either side of the cut. Tin these spots. Then solder a 1N5818 or 1N5819 Schottky diode across the cut, making sure the anode faces J104 and the cathode faces P100.

The Schottky diode has a very low forward voltage drop and will have almost no effect on the DC voltage. In addition, an accidental reverse voltage applied will have no effect whatsoever. However, D100 (1N4007) on top of the circuit board is in shunt with the applied DC and reverse biased. This would have sufficed for reverse voltage protection if you have a one-amp fuse upstream. I don't, so this is why I installed the Schottky diode.

All the remaining changes and additions will be done on top of the circuit board and on the front and rear panels.

With the front of the circuit board facing you, locate D100 just to the right of J104 at the right rear. Although it is no longer necessary for protection, it will provide terminals for the bypassing to be applied on the DC line to prevent any electrical trash from entering or leaving the 100A. Again, this may not always be necessary, but it is always valuable insurance.

Parallel-connect a 10 µF 16 volts or higher, a 0.1 µF, and a 0.001 µF capacitor together and solder their leads, cutting off the extra leads and leaving just two: positive and negative. Because there is very limited space around D100, a tantalum capacitor is preferred over an aluminum electrolytic. Slide the leads from this parallel combination under the leads of D100, making certain the positive lead is at the end facing the inside of the circuit board. Solder both connections and remove extra lead lengths. Check very carefully so you are certain there is no danger of a short circuit.

To make room for the LCD Dial/Clock, both the Bandwidth and RF Gain (actually, IF gain) controls must be removed. P103 (Bandwidth) must have the center and right-hand pins shorted together. A jumper may be used if you have any, or you can solder them together with a short piece of wire. See **Fig. 1** for details of changes to plugs on top of the circuit board. This connection mechanically programs the IF bandpass to its narrowest point.

On P101 (IF Gain), solder a short wire from the center pin to the left end of R129, which is just forward of P101. This DC grounds pin 5 of the IF amplifier U101 (1350P) which is already bypassed by C135. This programs the IF stage at its maximum gain.

Because the RIT will have no function once the peak circuit is added, it can be removed at this time. Note the detail in **Fig. 1.** The jack is cut off the wires to the RIT pot and the insulation stripped from all three. Connect a 2.4 k resistor to the short end of the red wire at the jack and bend the resistor down toward the bottom. Solder another 2.4 k resistor to the short blue wire and bend it down the same way. Bend the white wire down between the two resistors and solder the leads from both resistors to the white wire. Plug the jack just prepared into P102, with the resistors on the rear side of the jack.

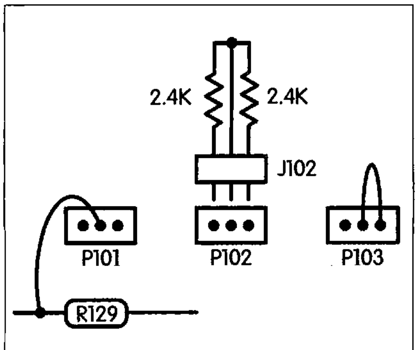

Fig. 1. Programming board connectors.

Continued on page 32

Mods for the OHR 100A

continued from page 31

The peak circuit is illustrated in **Fig. 2** and includes the wiring to the toggle switch and the AF Gain pot and J105. It can be constructed on a small piece of perfboard. The back-to-back diodes across the input must be germanium type, not silicon. Their function is to prevent high signal levels from overloading the peak circuit.

The peak circuit itself is a simple controlled positive feedback circuit. Gain is established at 20 dB by the circuit components. The 10 k trimpot enables tuning the peak from about 300 to over 1000 Hz. The peak is 160 Hz wide at the -6 dB points and 360 Hz at -12 dB. Because of the narrow bandwidth and the high gain, even signals otherwise down in the noise can be put completely in the clear. The narrow bandwidth also eliminates a great deal of white noise as well as nearby QRM, and results in a very low MDS.

Because the circuit board is opaque, I could not determine if there were any hidden traces where I wished to mount a standoff just forward of C152, so I did not drill a hole there. Instead, I epoxied a 4-40 threaded brass standoff one-quarter-inch high at the edge of the circuit board forward of C152, and with a long 4-40 screw and hollow standoff, I mounted the peak circuit constructed on perfboard at one corner at the brass standoff. The SPST toggle switch is mounted in the hole from which the RIT control was removed.

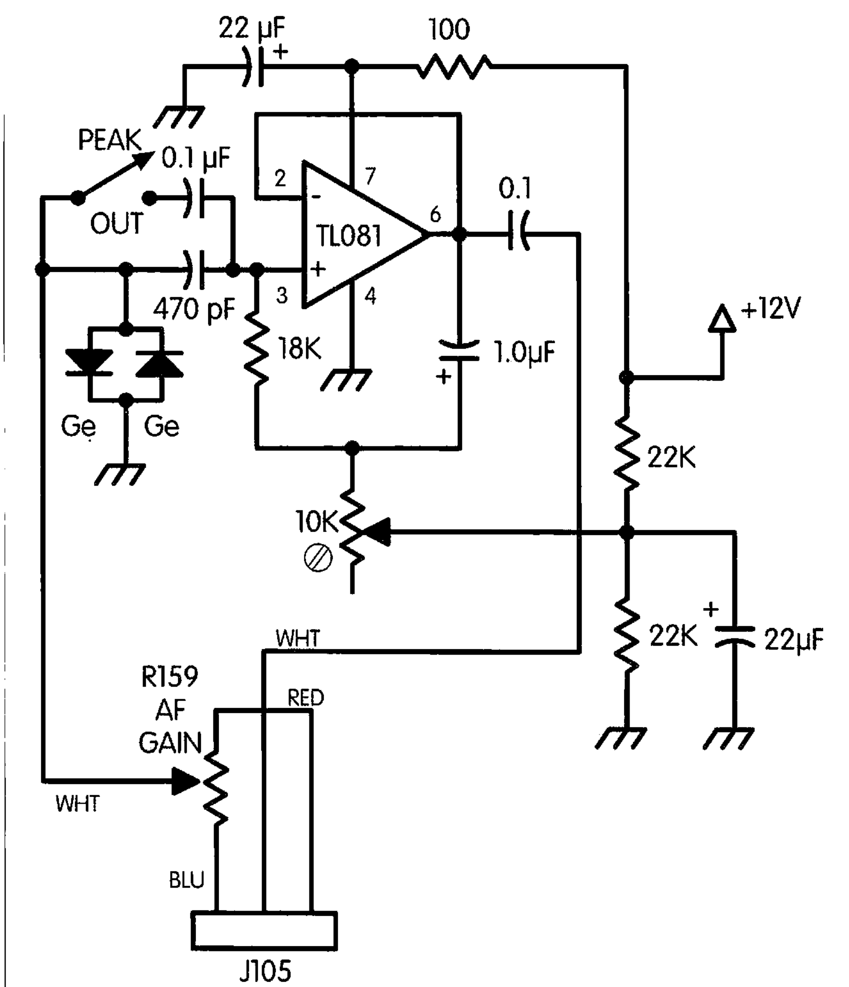

Fig. 2. Peak circuit, with switching and connections to AF circuit, designed by Jim Pepper W6QIF. Opening the switch activates the peak circuit. Closed, the switch prevents peak from working.

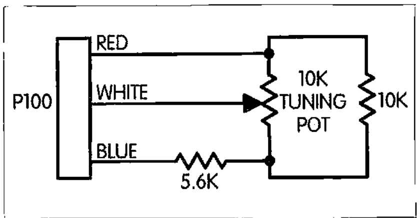

Fig. 3. Restricting tuning range.

If the LCD Dial/Clock and peak circuit are to be installed, you will want to eliminate a number of black silk-screened calibration marks and control identifications from the panel. Fortunately, this is very easy to do as long as you are *extremely* careful.

With a sharp knife with a very sharp point—a small penknife is preferred, or possibly an X-Acto® knife with a number eleven blade in it—use a light touch, and slowly and carefully scrape *very* lightly until the unwanted black marks disappear.

Done carefully, the markings will come off without affecting the cream paint finish on the panel. If you also intend to use the dial and/or a 10-turn pot, or restrict your tuning range, the calibration markings around the tuning pot must also be removed. When you are finished, you may be able to see a very faint "ghost" image of the marks removed, but they will be difficult to see unless you are looking hard for them. Be sure to leave intact the markings associated with the AF Gain control, and the manufacturer and model number on the panel.

If you have rub-on letters, you may wish to put "UTC" over the top of the hole from which the Bandwidth control was removed, and "Peak" or "PK" above the hole formerly occupied by the RIT control.

If you decide to restrict the tuning range by using a smaller value pot, or by shunting the existing pot with a resistor, make sure that the total resistance between the red and blue wires connecting the pot with P104 has essentially the same value as before making this change to avoid upsetting the circuit and the designer's intent. **Fig. 3** shows how I reduced the tuning range of my 30-meter 100A from over 75 kHz to about 32 kHz.

You will probably want to change the connector provided for your key. A board-mounted RCA jack (J102) at the rear panel is supplied. Because it would be difficult to remove from the board, I drilled a hole in the rear deck above J104, installed a standard 3.5 mm mono jack, and wired it in parallel with J104.

The four-digit LCD Dial/Clock is actually a microprocessor-controlled frequency meter with a maximum input frequency of 32 MHz, combined with the functions of a 24-hour clock. It operates at a clock frequency of 32,768 Hz and at 5 V to VCC to prevent RF hash when mounted in a receiver. It is supported by a comprehensive 58-page manual, step-by-step instructions similar to the old Heathkit manuals, and clear illustrations. It is three and one-half inches by one and one-half inches and normally mounts one-quarter inch behind the panel. The display is viewed by a horizontal rectangular cutout in the panel.

As many as 31 different offsets can be mechanically programmed into the dial/clock, so it is suited to multiband rigs. However, with monobanders only a single offset need be programmed. Offsets are retained in nonvolatile memories and no backup battery is needed except for the clock function. The clock requires a 6 V lithium battery for backup to keep the clock on time when the rig is not being powered. This battery is not supplied with the kit.

Default and normal readout show three digits of kHz, a decimal point, and a single digit of hertz, with a resolution of 100 Hz. A MHz button supplied displays two MHz and two kHz digits momentarily. I omitted this because I know I'm on 30 meters with my 100A.

The Clock button displays UTC in two digits on either side of a colon in a 24-hour format. Up and Down buttons on the rear of the dial/clock are used both to set the offset and to adjust the clock to the correct time.

RF to this dial is taken from the junction of C211 and C212 through a short piece of RG174/U coax.

Adjusting the peak circuit

The peak circuit must be tuned to the offset you use. Radiate a 100 kHz signal from a crystal marker generator to the OHR 100A. Be sure the peak circuit is switched off. Adjust C146 as suggested in the 100A manual for the offset you prefer while listening on the lower sideband. Then, without touching the tuning dial, adjust C103 while transmitting into a dummy load and measuring the output frequency at the SO-239 with a frequency counter.

Unkey the rig when you have an output frequency of 10.100,000. Now switch the peak circuit into the audio channel. With a small screwdriver adjust the 10 k trimpot on the peak circuit for the *loudest* signal by ear. This assumes you have not touched the tuning knob and are still listening to the marker generator signal. You will probably have to adjust the AF Gain control to reduce the signal level because of the high gain of the peak circuit.

Now your audio peak is and will remain at the offset frequency you selected. Your transmitter is offset high by this amount. When you tune in a signal at its loudest while using the peak circuit, your transmitter will automatically be zero beat with the transmitter providing the received signal, and your signal will be in the center of the other receiver passband.

Final dial adjustment

Now that your transmitter is set at exactly 10.100,000 MHz, the LCD display should indicate 100.0. If it is off a few digits, use the Up and Down buttons to display the correct frequency. Refer to the manual for the LCD Dial/Clock to make certain you have the correct offset programmed into nonvolatile memory.

A final comment

If you have made all these changes, now you not only know where you are in the band, but you also can tune in any signal for its loudest level in headphones or speaker and know that when you touch the key you will bore a QRP hole in the center of the other guy's or gal's receive filter. And you will always have the correct UTC time for your log! 73

Here Comes the Sun

Part 2: Geomagnetic monitoring.

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[thomil@bioelectrifier.com]

Even though it's possible to get geomagnetic data from the *GOES 8* and *GOES 9* satellites via the Internet, it's a lot of fun to monitor the effects of solar activity with your own equipment. While the changes in the magnetic field are much smaller on the surface than at an altitude of 23,000 miles, they still can be measured. Also, since it's impractical to monitor the Internet 24 hours a day, it would be handy to have a device to sound an alert whenever a strong geomagnetic event is detected.

One of the easiest effects to measure is "Earth Currents." Whenever the geomagnetic field changes, electricity is induced in all conductors within it, and this includes the Earth itself. By driving a pair of long copper rods into the ground 100 feet or more apart, a voltage differential can be measured between them when the field shifts. Connect each rod to the meter with shielded cable, and ground the shield at one end only. The meter must be a zero-center type, since the polarity depends on the direction of the magnetic shift. A sensitive zero-center microammeter with several switchable series resistors could be used to set different ranges. You could also use an auto-polarity digital multimeter set to the mV scale.

A second method of monitoring geomagnetic shifts is to use a compass. Since it's no fun to sit staring at the little blue arrow all day, we can build a circuit that will do this for us. The easiest way is to drill a small hole, 1/16-inch or less, through the compass disk near the rim, at the EAST position. Drill a matching hole at the WEST position so that the disk will still balance on the needle.

By shining light from an infrared LED through one of these holes and receiving it with a phototransistor below the disk, we can tell if the compass disk rotates even slightly. The circuit shown in **Fig. 1** can be used to activate a small piezo alarm when the light is cut off. You don't need the entire compass—just the disk and needle. I mounted mine on a small piece of pine board which I could then rotate slowly until the hole in the disk matched the position of the LED and phototransistor.

This device, though simple to the extreme, is actually quite sensitive, as you can prove by waving a small magnet around the room. You will need to put a box over the whole thing to prevent air currents from disturbing the compass.

An even more sensitive device is the magnetometer. Originally designed as a "UFO Detector," this device has an iron rod that serves the same function for the magnetic field as an antenna does for radio waves. The lines of flux from the geomagnetic field are concentrated in the iron, and a coil consisting of many turns of fine wire is wound around the rod. Changes in the magnetic flux induce a voltage in the coil, which can then be amplified and used to trigger an alarm.

Iron rods are not commonly found around the house, but for our purposes, milled steel will work just fine. (It is, after all, more than 90% iron.) For portable devices, a #10-32 bolt passed through the center of a coil from a small relay will make a good sensor that will fit inside the enclosure used for the electronics.

Increasing the size of the rod and the number of turns will make the device far more sensitive. The best one I've built consisted of an entire one-quarter-pound spool of #36 magnet wire. I

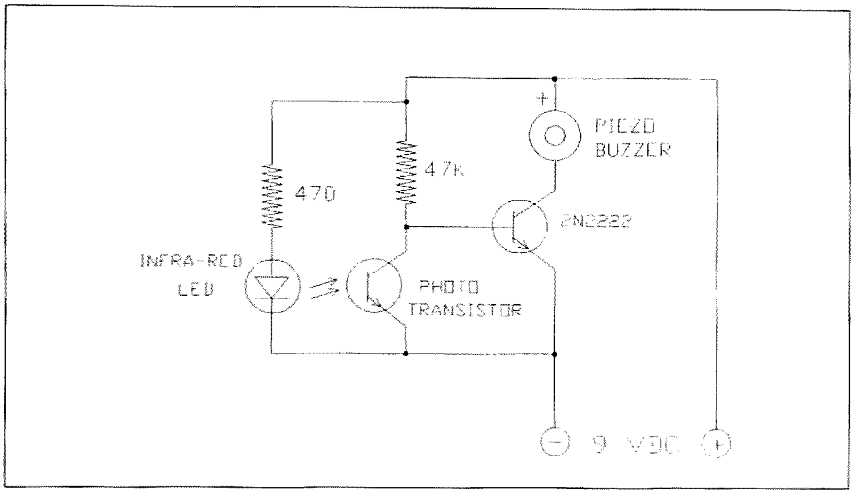

Fig. 1. The "Dark Detector." By positioning the LED above a hole in the compass disk and the phototransistor below, the alarm will sound when small magnetic fluctuations cause the compass to rotate.

didn't *wind* the coil—I just fished out the inner end of the wire and used the whole spool as it was. The plastic spool had a one-inch diameter hole through it, so I used a piece of one-inch round steel bar stock 18 inches long, passed through the center of the spool. Coated with urethane varnish and mounted inside a piece of plastic PVC pipe, it made a very sensitive sensor when mounted on the roof, away from stray magnetic fields.

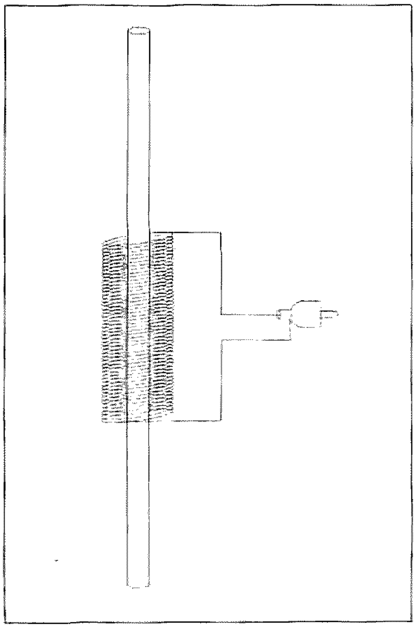

Fig. 2. A very large coil of fine wire wound around a bar of iron or steel will detect very small fluctuations in the geomagnetic field.

Fig. 3 shows the circuit diagram of the magnetometer. One stage of a dual op amp amplifies the signal from the sensor, which is then fed to a window comparator using an LM339. The output from the comparator triggers a 555 timer connected as a one-shot, which turns on the piezo alarm for several seconds. The gain of the amplifier stage is set with a one-megohm pot, which is adjusted just below the point at which the alarm sounds.

The second section of the dual op amp is used as an audio amplifier. The 2.2-μF capacitor couples any audio frequencies detected by the sensor to the op amp, which can then be heard via headphones or connected to an external amplifier and speaker. Some very strange sounds can occasionally be heard from this device, especially before a thunderstorm. (Of course, if you're using an outside-mounted sensor and AC line power, *do not* use this device *during* a thunderstorm ... especially when using headphones!)

The switch in series with the piezo alarm lets you turn the alarm off. This is handy for adjusting the gain, and also so that you can advance the gain to maximum and listen to the audio without being driven insane by the constant beeping.

Fig. 4 shows the printed circuit board pattern for the magnetometer, and **Fig. 5** shows the parts layout. Be sure to orient the integrated circuits,

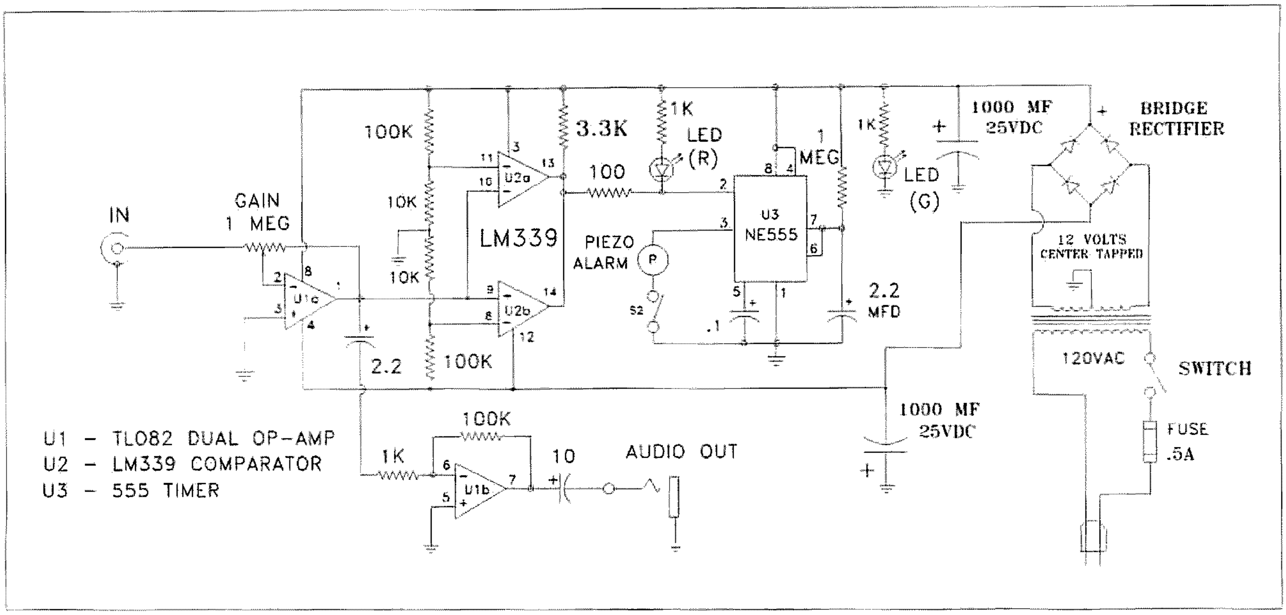

Fig. 3. The schematic diagram of the "UFO Detector" magnetometer. This circuit will amplify the signal from the sensor and trigger an alarm.

rectifier, capacitors, and piezo alarm as shown, since they will be damaged if reversed.

The circuit shown is AC line-powered, but you will probably need to use one or more AC line filters ahead of the device to prevent stray line noise from triggering the alarm. Even so, it may react to the occasional light switch or a motor starting up somewhere in the house. Using battery power (a pair of nine-volt batteries) eliminates the noise, but this makes long-term monitoring a problem, since the batteries will only last a few days. I've found that AC power works best for continuous monitoring, and I've also built several battery-powered devices which are great for portable use.

The magnetometer, used with an external sensor, is very sensitive to changes in the geomagnetic field. Besides solar-induced effects, it will also respond to large, moving ferrous objects, such as nearby cars and trucks. It will alert you to an approaching

Continued on page 54

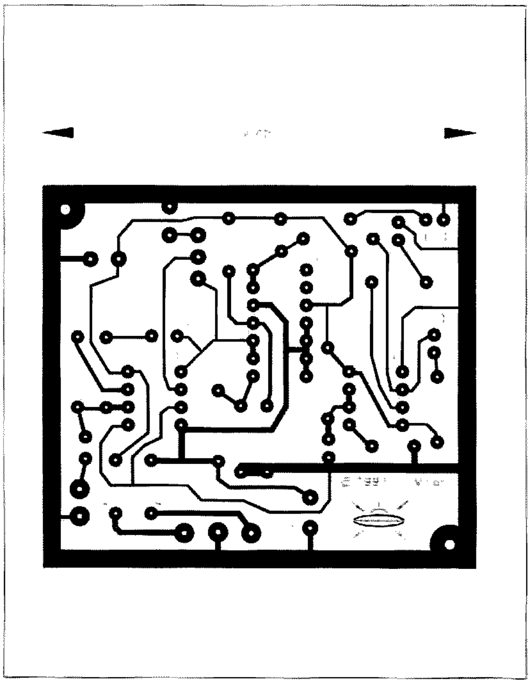

Fig. 4. Printed circuit board pattern for the "UFO Detector" magnetometer.

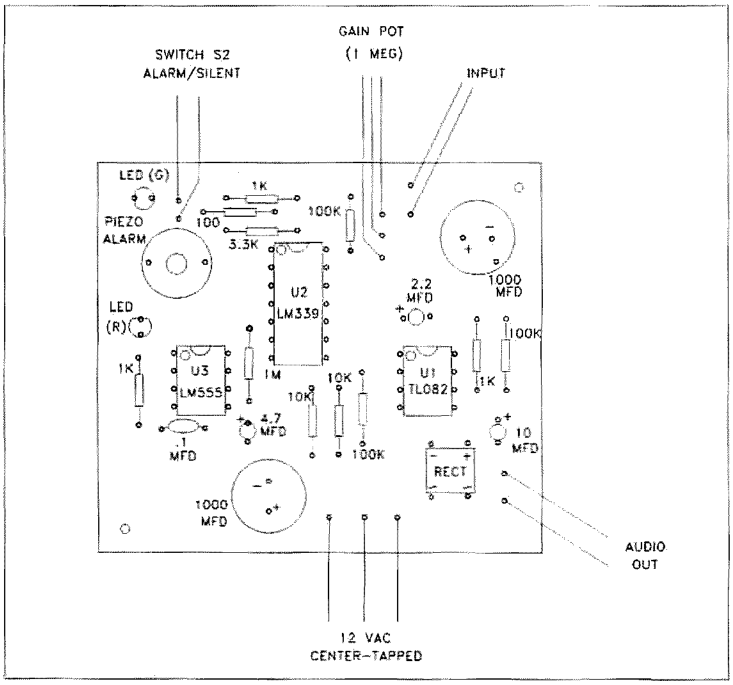

Fig. 5. Parts layout for the magnetometer circuit board. Be sure to orient the components as shown.

Number 37 on your Feedback card

SPECIAL EVENTS

Listings are free of charge as space permits. Please send us your Special Event two months in advance of the issue you want it to appear in. For example, if you want it to appear in the May issue, we should receive it by February 28. Provide a clear, concise summary of the essential details about your Special Event.

FEB 13

HARRISBURG, PA The Harrisburg Radio Amateur Club will hold a Valentine Hamfest, Sat., Feb. 13th, at the Oberlin Fire Company in Harrisburg. Directions: I-283 to Swatara PA-441 Exit (#1). Turn north onto PA-441 (toward Bob Evans Restaurant). Turn left at the traffic light onto Eisenhower Blvd. Turn right at the next traffic light, remaining on PA-441. Turn right at the stop sign. The Fire Hall is 0.2 mi. on the right. There will be signs from I-283. General admission at 8 a.m., $2; sweethearts, XYLs, and harmonics free. Table setup at 6 a.m. Friday night setup if needed. VE exams will be conducted nearby at 9 a.m. Tables are $8 in advance. Very limited tailgating, $2. For table registration, contact *N3NJB, 2501 S. 2nd St., Steelton PA 17113-3009. Phone (717) 939-4825; or E-mail [n3njb@juno.com].*

NEGAUNEE, MI The Hiawatha ARA will hold its 20th annual Swap and Shop Feb. 13th from 9 a.m.–3 p.m. at the Negaunee Township Hall, 42 M35, Negaunee MI. Admission $2, tables $6. Food and beverages will be available at the site. For more info, contact *Bob Serfas N8PKN, (906) 226-9782; or John Veiht N8RSE, (906) 228-9417.*

TRAVERSE CITY, MI Cherryland ARC's 26th Annual Swap-n-Shop will be held 8 a.m. to noon at the Immaculate Conception Middle School. VE exams. Pre-register or register at the Swap. Talk-in on 146.86. For more info, call *Joe W8TVT at (616) 947-8555; or Chuck W8SGR at (616) 946-5312.*

FEB 14

ROCK ISLAND, IL The 28th Annual Davenport RAC Hamfest/Computer Show will be held at the QCCA Expo Center, 2621 4th Ave., Rock Island IL, which features a large, open exhibition floor with wide aisles, ample free parking, and one-level handicapped accessibility. The hamfest features a large indoor flea market, commercial exhibits, food, and door prizes. Talk-in on the WOBXR 146.28/.88 and 146.04/.64 rptrs. Tickets are $5 in advance, $6 at the door (under 14 free). For more info on tickets or table reservations, send an SASE to *Kent Williams K9UQI, 4245 10th St., East Moline IL 61244-4154. Voice: (309) 796-0718 (4–9 p.m. only, please). FAX: (309) 796-0629 (24-hr). E-mail: [k9uqi@arcsupport.com].*

FEB 20

ELMIRA, NY The ARA of the Southern Tier will present its 18th Annual Winterfest on Sat., Feb. 20th, at the Elmira College Murray Athletic Center Domes, NYS Route 14, five miles north of Horseheads NY. Talk-in will be on 147.360(+). There will be dealer displays of new equipment, and a huge indoor flea market. Breakfast and lunch will be served on the premises. Admission is $5 at the door, children 10 and under admitted free. The event will run from 8 a.m.–3 p.m., with VE exams starting at 9 a.m. For dealer and table rental inquiries, contact *Gary N2OKU at (607) 739-0134.*

RICKREALL, OR The Salem Repeater Assn. and Oregon Coast Emergency Repeater, Inc., will present the 1999 Salem Hamfair & Computer/Electronic Swapmeet, Sat., Feb. 20th, at the Polk County Fairgrounds in Rickreall. Doors open at 9 a.m. Pre-registrations postmarked by Feb. 5th will receive an extra door prize ticket with each registration. Registrations received on or after Feb. 14th will be held for pickup at the door. Participants 13 years of age or older must be registered to enter the hamfair. For pre-registration, contact *Evan Burroughs N7IFJ at (503) 585-5924 (before 8 p.m.), or E-mail to [n7ifj@teleport.com].* Swap table setup will be Fri. night, 6 p.m.–9 p.m. and Sat. morning at 7 a.m. Self-contained RV spaces available. Features include: swap tables; commercial dealers; and meetings—ARRL, ARES/RACES, and others as announced. No VE testing is planned. For more info contact the Web site at *[http://sra.goldcom.com/sraflyer.htm].* Talk-in on the 146.86 rptr.

FEB 21

FARMINGTON HILLS, MI The Livonia ARC will present its 29th Annual Swap 'n' Shop, Sun. Feb. 21st, 8 a.m.–3 p.m., at The William M. Costick Activities Center, 28600 Eleven Mile Rd. (between Middlebelt and Inkster Roads), Farmington Hills MI. Talk-in on 144.75/5.35. For info, send 4 x 9 SASE c/o *Neil Coffin WA8GWL, Livonia ARC, P.O. Box 51532, Livonia MI 48151-5532;* or call the club phone line, *(734) 261-5486.* The club Web page is at *[www.larc.mi.org].* They can also be reached by E-mail at *[swap@larc.mi.org].*

FREEPORT, NY The Winter 1999 Long Island Indoor Hamfest will be held 8:30 a.m.–1 p.m., Sun., Feb. 21st at Freeport Armory, 63 Babylon Turnpike, Freeport NY. General admission $6. Vendors $25 per space by advance registration only (no day-of-event sales). Each space includes one six-foot table and admits one person. Special close parking and/or dropoff area for vendors opens 6 a.m. for vendors only. Free parking for buyers. The flea market will feature amateur radio equipment, computers, ham equipment dealers, ARRL information, LIMARC information, and CB equipment. There will be a free VHF tune-up clinic. Walk-in VE exams at 10 a.m. for all classes (one session). Talk-in on W2VL, 146.85 rptr., 136.5 pi. For further info, call the LIMARC 24-hour infoline: *(516) 520-9311,* or write *LIMARC Hamfest, P.O. Box 392, Levittown NY 11756. E-mail [hamfest@limarc.org]; Web [http://www.limarc.org].*

NEW WESTMINSTER, BC, CANADA The Burnaby ARC's 11th Annual Fleamarket will be held at New Westminster Armouries, 6th St. and Queens Ave., New Westminster, BC. Open to sellers at 9 a.m., buyers 10 a.m.–2 p.m. Tables available in advance; please phone between 7 p.m. and 9 p.m. PT. *Harry VE7HNC, (604) 530-3962.* Talk-in on VE7RBY 145.35(-) or 442.85.

FEB 27

MILTON, VT The Radio Amateurs of Northern Vermont will sponsor the Northern Vermont Winter Hamfest and ARRL Vermont State Convention on Feb. 27th, 8 a.m.–3 p.m., at Milton High School, Route 7 in Milton, five miles north of I-89 exit 17. Features include flea market, forums, auction, dealers, book sales, and exhibits. VE exams will be given at 9 a.m. and 2 p.m. Commercial exams at 2 p.m. Admission is $3, free for under 18 years old. Tables are free while they last. Call for large setups. Talk-in on 145.15 rptr. Contact *W1SJ at (802) 879-6589; E-mail [w1sj@vbimailmail.champlain.edu].* The Web site is at *[http://www.ranv.together.com].*

FEB 28

ANNANDALE, VA The Vienna Wireless Society will conduct its 23rd Winterfest on Sun., Feb. 28th, 1999, at the Annandale (VA) campus of the Northern Virginia Community College, in the gymnasium of the Ernst Cultural Center. Admission $5, XYLs free. Tailgating starts at 6 a.m. in the parking lot south of the Ernst Cultural Center. The $10 tailgate fee includes admission. VE exams begin at 8 a.m. sharp. Walk-ins permitted. For more info, call *Jim Parsons WA4LTO at (703) 392-0150, or E-mail [k3mt@erols.com].* The Web site is at *[http://www.erols.com/k3mt/vws].*

CUYAHOGA FALLS, OH The Cuyahoga Falls ARC, Inc., will hold its 45th Annual Hamfest Electronic and Computer Show Sun., Feb. 28th, at Emidio & Sons Party Center, 48 E. Bath Rd. at the corner of State Rd. in Cuyahoga Falls. The event will be

held 8 a.m.–2 p.m. Tickets are $4 in advance. $5 at the door, and are available from club members. Free parking. Rent eight-foot tables for $8 each; reserved tables must be paid for in advance. Contact *Carl Hervol N8JLQ, 11192 Cottingham Circle, Uniontown OH 44685-9185; (330) 497-7047.* Talk-in on 2m 147.87/.27 MHz.

MAR 5–6

PASCAGOULA, MS The Jackson County ARC will hold its 5th annual hamfest in the Pascagoula MS Civic Center, located on the Jackson County Fairground. Hours are 5 p.m.–9 p.m. Friday, Mar. 5th, and 8 a.m.–3 p.m. Saturday, Mar. 6th. Tickets are $2.50 for 12 years and older, under 12 free. Table rental is $8/ eight-foot table. RV parking available on site. VE exams at 9 a.m. Saturday, Mar. 6th. For more info on the hamfest or VE exams, contact Hamfest Chairman *Charles F. (Kim) Kimmerly, 19000 Busby Rd., Vancleave MS 39565. Tel. (228) 826-5811.* Talk-in on the W5WA repeater, 145.110 (-)/ 146.880 (-).

MAR 6

KNOXVILLE, TN The Shriners of Kerbela Amateur Radio Service will sponsor their annual hamfest at Kerbela Temple, 315 Mimosa Ave., in Knoxville, from 8 a.m.–4 p.m. Admission is $5. Indoor vendor tables are $8 each, plus admission of $5. Setup Friday 4 p.m.–8 p.m., and Saturday 5 a.m.–8 a.m. Overnight security will be provided. Talk-in on 144.83/ 145.43 or 146.52 simplex. Smoking indoors is permitted in designated area only.

MAR 6–7

NEW PORT RICHEY, FL The 3rd Annual "Hamfest Under the Sun" Amateur Radio & Computer Show will be sponsored by the Gulf Coast ARC at the Fred K. Marchman Technical Educational Center, 7825 Campus Dr. Gates open Sat. Mar. 6th, 8 a.m.–5 p.m., and Sun., Mar. 7th, 8 a.m.–3 p.m. No alcohol or drugs permitted on the premises. Admission $4. tables $4, tailgaters $4. Each table and tailgate space includes an admission ticket. Commercial spaces are available. For further info, contact *Rick KF4GXS, (813) 842-2127: E-mail [richar@gte.net].* Make checks and money orders payable to *Gulf Coast Amateur Radio Club*, and mail to *P.O. Box 595, New Port Richey FL 34656-0595.* Talk-in on 146.670 or 145.330 MHz club rptrs.

MAR 7

WESTFIELD, MA The Mount Tom Amateur Repeater Assn., Inc., will sponsor the 14th Annual MTARA Flea Market at the Westfield Middle School, Rt. 202/10, West Silver St., Westfield MA. Doors will open at 7 a.m. for vendors, and 9 a.m. for bargain hunters. Admission $4, children under 12 free. Tables $15 in advance only: tailgating $5. 120 VAC available. Amateur radio equipment, computers, and parts. Help provided for loading and unloading. Handicapped parking, no stairs. Amateur and commercial VE exams given at 10 a.m.; contact *Jim WA1ZUH at (413) 245-3228* for details. Contact *Steve N1SR at (413) 593-6554,* for GROL, GMDS-O/M, ship radar, etc., exams. Talk-in on the 146.940(-) rptr. For table reservations, contact *Jim N1RUT, (413) 536-5182, or [jim.allen@the-spa.com].* See the Web site at *[www.mtara.org]* for more info and for driving directions.

MAR 13

SCOTTSDALE, AZ The Scottsdale ARC will host a Hamfest at Scottsdale Community College, 101 North - Exit Chaparral Rd., 9000 E. Chaparral Rd., Scottsdale AZ. Admission $2. tables $5. Talk-in on 147.18 and 440.00. Contact *Roger Cahoon KB7ZWI, 8501 E. Edward, Scottsdale AZ 85250. Phone: (602) 948-1824; FAX: (602) 943-3548.*

WEST ORANGE, NJ A Hamfest for Amateur Radio ops, computer buffs, SWLers, and electronics hobbyists will be sponsored by the Roseland Radio Club at West Orange High School, 600 Pleasant Valley Way, West Orange NJ, exit 7 off Interstate Route 280. Free parking, ground level access. Rain or shine. All indoors. Admission $5 at the door (no advance tickets). XYL/children under 12 admitted free. Tables reserved in advance are $12 for the first/$9 each additional. At the door, tables are $15 for the first one/$12 each additional. You must RSVP by March 1st. After that, first come, first served. Sellers only are admitted at 7 a.m., no exceptions. There is a special vendor parking lot. Talk-in on the W2QR rptr. system at 146.415(+1.0) 85.4T; 224.480(-1.6) no tone; 447.875(-5.0) 156.7T; or 146.520 simplex. VE exams. For more info contact *Jim Howe N2TDI or Liz Howe N2WGH at (973) 402-6066.*

MAR 14

STERLING, IL The Sterling-Rock Falls ARS 39th Annual Hamfest will be held at the Sterling High School Fieldhouse, 1608 4th Ave. Free parking, including areas to accommodate self-contained campers and self-contained mobile homes. There will be a large indoor flea market featuring radio, electronic, computer, and hobby items. Tickets are $3 in advance, $4 at the door. Tables are $5 without electricity, $6 with electricity. Bring your own cord. Setup Sat. 6 p.m.–9 p.m. and on Sun. beginning at 6 a.m. Doors open to the public at 7:30 a.m. Sun. Use only the north doors on Miller St. Talk-in on 146.25/.85 W9MEP rptr. For info and advance tickets/tables, contact *Lloyd Sherman KB9APW, Sterling-Rock Falls ARS, P.O. Box 521, Sterling IL 61081-0521; or call (815) 336-2434. E-mail [lsherman@essexl.com].* Advance ticket deadline is Mar. 1st. Please include an SASE with payment.

MAR 21

JEFFERSON, WI The Tri-County ARC will present "Hamfest 1999" at the Jefferson County Fairgrounds Activity Center, Highway 18 West, Jefferson WI, 8 a.m.–2 p.m. Vendors admitted at 7 a.m. VE exams for new licensees and upgrades. Electricity available. Equipment test table. Handicap accessible. Talk-in on the 145.49 rptr. Admission $4. six-foot table $5, eight-foot table $6. To reserve tables, send your SASE to *TCARC, W9MQB, 711 East St., Ft. Atkinson WI 53538. Phone (920) 563-6502 eves.; E-mail [tricountyarc@globaldialog.com].*

MAUMEE, OH The Toledo Mobile Radio Assn. will hold the 44th Annual Hamfest/Computer Fair 8 a.m.–2 p.m. at the Lucas County Recreation Center, 2901 Key St., Maumee OH. For details send SASE to *Paul Hanslik N8XDB, P.O. Box 273, Toledo OH 43697-0273. Phone: (419) 243-3836.*

HAMILTON TOWNSHIP, NJ "Hamcomp '99" hamfest will be sponsored by the Delaware Valley Radio Assn., and held at the Tall Cedars of Lebanon picnic grove, Sawmill Rd., Hamilton Twp., NJ. Take I-95 North to I-295 South; exit 60A to I-195 East; exit 2 to Yardville; South Broad St. to end, approx. 3.7 miles; go left at Yield onto Old York Rd., next right onto Sawmill Rd. The site is 1.1 miles on the right. Open to sellers at 6:30 a.m. Open to buyers at 8 a.m. Admission is $6, non-ham spouses and children admitted free. Tailgating space $10, includes one admission. Free parking. ARRL table. Covered table space $15, includes one table and one admission, some electricity. Advance covered space reservations are available. Talk-in on 146.67(-). More info available at *(609) 882-2240 or [www.slac.com/w2zq].* Send payment with SASE to *Hamcomp '99, DVRA, P.O. Box 7024, West Trenton NJ 08628.*

MAR 27

MICHIGAN CITY, IN The annual Michigan City Hamfest and Computer Flea Market will be held Sat., Mar. 27th at Michigan City High School, 8466 W. Pahs Rd., Michigan City IN. 8 a.m.–1 p.m. CST. Early setup provided for vendors. Admission is $4, children under 12 admitted free with a paid adult. Table reservations and general info is available from *Ron Stahoviak N9TPC, 5802 N 400 W, Michigan City IN 46360. Phone (219) 325-9089.*

WATERFORD, CT The Radio Amateur Society of Norwich will sponsor their 27th Ham Radio Auction, starting at 10 a.m. Setup at 9 a.m. The auction will be held at the Waterford Senior Center. From Hartford, take Rt. 2 South to Rt. 11 to Rt. 85 South. From the shoreline, take Rt. 95 to Rt. 85 North. Talk-in on 146.730(-). Bring your gear to sell (10% commission to RASON). Free admission. Free parking. Contact *Tony AA1JN at*

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Above & Beyond

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C. L. Houghton WB6IGP
San Diego Microwave Group
6345 Badger Lake Ave.
San Diego CA 92119
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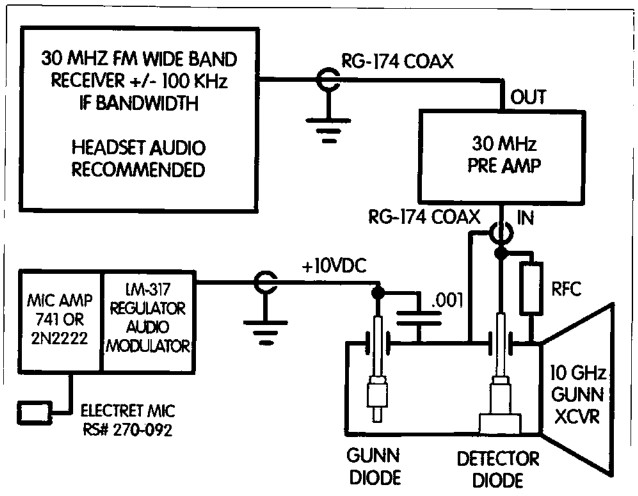

Fig. 1. Block diagram of 10 GHz system showing 30 MHz IF receiver with preamplifier, diode detector in cavity for receive, and Gunn diode in cavity for transmit. Modulator for Gunn diode is simple power supply voltage regulator, audio amp, and electret mike.

10 GHz fun, 1999 update: the Ramsey FR-10 receiver

Quite a few years ago, I wrote an article covering a 30 MHz receiver using a single chip receiver from Signetics, the TDA7000. The purpose of this receiver and associated modulator was to provide a simple and effective method to get started on 10 GHz with wideband FM communications using surplus Gunn diode oscillators. The Gunn diode oscillators were obtained from garage door openers and from burglar alarm circuitry.

The conversion of the burglar alarms and the door openers was mainly to toss away everything except the metal cavity containing the microwave oscillator and detector diode. While these units are not as plentiful today, they can still be located in surplus, either at swapmeets or by scrounging in electronics junk bins.

Another source for Gunn diode units is SHF Microwave Parts Co., 7102 W. 500 S., La Porte IN 46350 [FAX (219) 785-4552 or E-mail through their Web page at (www.shfmicro.com) for details]. Together, Alan and his wife Pierrett have put together a great source for Gunn diode transceivers of various models for both 10 and 24 GHz frequency ranges. Take a look on their Internet page for current material. The 24 GHz Gunn oscillator is available for $58 with varactor control (±170 MHz) at 24.150 MHz (also includes a detector). Quite a bargain for a new unit!

These devices are listed on the SHF Microwave Web page. The unit is pictured, and specifications tell you in detail what you are looking at. Other items related to microwave operation are also listed, providing a complete list of all they offer. Be sure to check out SHF Microwave Parts Co. You'll be glad you did.

Available items include new Gunn-type oscillator detectors, and once in a while used items pop up. These units vary in complexity from simple Gunn diode oscillator detector diode units to those that are fitted with a third device, a varactor diode. The varactor diode allows for an easy frequency adjustment that is controlled by a DC voltage applied to it. While Gunn cavities that employ varactor diodes are more costly, they are much sought after for ease of operation related to varying frequency of operation.

Gunn diode oscillator systems are inexpensive to start off with, using wideband FM rather than a more sophisticated SSB system. Well, the main difference among them is price and the test equipment needed to modify and test an SSB-type system. The cost for a working wideband FM system is about $80, assuming that you purchase the components new. This differs from SSB-type systems, whose cost could run as high as $250 for a kit of parts that you still have to modify from commercial frequencies to 10 GHz. There are fully assembled transceivers available from European manufacturers in a ready-to-use assembled unit for $600 to $1000, depending on RF power output.

While I operate on both wideband FM and SSB, I still recommend wideband FM for a beginning taste of microwave operation. As a matter of fact, I am in the process of constructing a 24 GHz wideband FM transceiver for use in the ARRL 10 GHz-and-up contest and to update with the Ramsey 30 MHz FM receiver system.

As I stated earlier, I began using a Signetics TDA7000 single-chip FM receiver tuned

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(860) 859-0162, or see the RASON Web page at *[www.ims.uconn.edu/~rason]*.

MAR 28

MADISON, OH The Lake County ARA will hold its 21st annual Hamfest on Mar. 28th, 8 a.m.–2 p.m., at Madison High School on Burns Rd. in Madison. The hamfest will feature new and used amateur radio, computer, and assorted electronic equipment, amateur-radio-related forums, an equipment test bench, and VE exams for those interested in earning an amateur radio license. Admission tickets are $5 at the door. Table space for vendors is $8 for a six-foot table; $10 for an eight-foot table. Reserve tables by calling *Roxanne at (440) 256-0320*. Talk-in on the LCARA 147.21 rptr.

SPECIAL EVENT STATIONS

FEB 13–14

ALEXANDRIA, VA The Mount Vernon ARC will operate K4US 1600Z–2100Z Feb. 13–14 to commemorate George Washington's Birthday. Transmission will take place from Mt. Vernon (VA). Frequencies include 7.240 MHz, 14.240 MHz sideband and 10.110 MHz or 18.080 MHz CW. For an 8-1/2 x 11-inch certificate, send QSL and SASE to *MVARC, P.O. Box 7234, Alexandria VA 22307*.

MAR 27

MACON, GA The Macon ARC will operate W4BKM 1500–2300 UTC on Sat. Mar. 27th, at the 17th annual Cherry Blossom Festival in Macon GA. Phone: 7.235, 14.240 and 21.335; CW 7.135, 14.035 and 21.135. For a certificate, send your QSL and a 9 x 12 SASE to *Macon ARC, P.O. Box 4862, Macon GA 31208*.

to 30 MHz for earlier transceivers. The modulator is nothing more than a voltage regulator that has its adjust terminal modulated with a low-level microphone-driven amplifier. The audio amp can be as simple as a single transistor or op amp, with parts availability determining how low the cost.

What then can be improved in the circuit designed earlier? Well, today the TDA7000 single-chip FM receiver design still works well and is still in my shack functioning. However, several things have come to my attention concerning parts availability and cost in general. The TDA chip I used earlier is getting hard to obtain, and the scrounging of component parts has created a delay factor for many amateurs in getting on 10 GHz quickly, not to mention 24 GHz, which is even more difficult.

Considering all this, I started to look at designing a new 30 MHz receiver (IF), but after looking at what was available on the commercial market, I have reconsidered designing a new receiver. What I discovered was a kit from Ramsey Electronics for a 10-meter FM receiver. This kit from Ramsey was very reasonably priced, making it attractive. Looking at Ramsey's literature and design specifications, I was quite taken by this

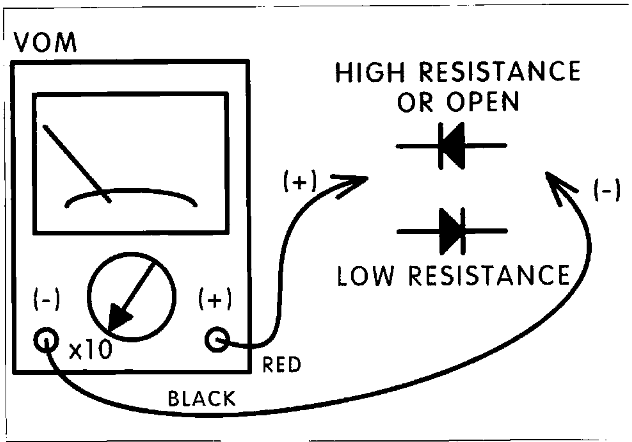

Fig. 3. Diode ohmmeter check to verify diode polarity. Application the same regardless of whether regular diode rectifier or varactor diode.

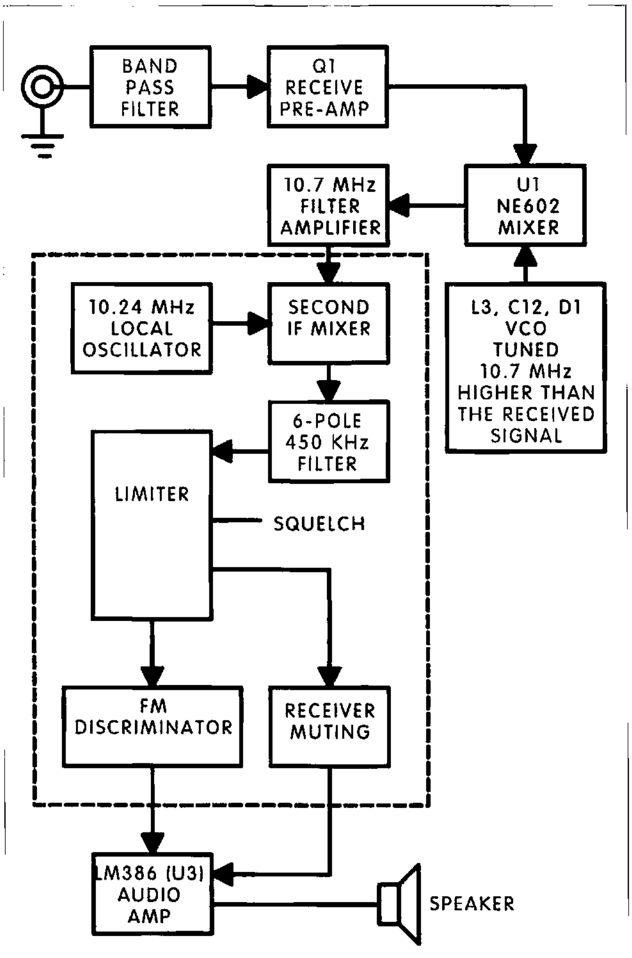

Fig. 2. Block diagram of Ramsey Electronics FR-10 30 MHz receiver kit with internal preamplifier, an excellent bargain that comes with all components needed to form an operational FM receiver. This receiver interfaces quite well with the Gunn diode transceiver system for either 10 GHz or 24 GHz operation requiring a 30 MHz wideband FM receiver system.

very fine and inexpensive FM receiver. The Ramsey FR-10 unit will interface well for the 30 MHz FM receiver portion of the Gunn transceiver with a few simple modifications to the original design.

Fig. 1 shows the functional block diagram of a basic wideband FM microwave system. This month, let's limit our scope to the 30 MHz wideband FM receiver, covering the assembly and modification of the Ramsey Electronics FR-10 receiver. Next time, I will cover the construction and assembly of the remainder of the system—the power supply modulator—and describe some testing methods.

Ramsey FR-10 FM receiver

I obtained two FR-10 receiver kits to construct two separate transceivers, one for Kerry N6IZW and one for myself, to allow testing of the finished product over a test range of about three miles. Performance testing is kind of difficult without a partner, be it on 10 or 24 GHz or somewhere else. It's kind of hard to talk to yourself, making a partner very important for experimentation on microwave.

The Ramsey kits arrived, and construction evaluation began right away as I was anxious to get started. Looking over the literature supplied with the kit, I was surprised with the detail that was presented. It was quite sufficient to enable a beginner with limited construction ability to finish this kit and make it operational. The construction was presented in the Heathkit fashion familiar to many amateurs. An introduction is followed by a "how to construct your work area," a circuit description, and block diagrams on operation, all providing enough detail for familiarization with the FR-10.

After a review of the intro documentation, the component parts are checked. I might suggest a sorting procedure to avoid confusion when stuffing the PC board with components. Sort component parts onto pieces of paper with a pencil notation as to individual value. Place resistors on one paper so marked and capacitors on another. This makes for simple assembly without having to identify by color code or value once you begin construction. In sorting resistors, I always use a simple ohmmeter check to verify what these eyeglasses and magnifying lenses decode from the color bands.

A little preparation at the beginning might save you time later when you test the system out. Follow the construction details outlined in the Ramsey literature. The construction is quite easy, as each component part number is printed on top of

the circuit board to further ensure that you are placing the correct component in the proper location. The only error you could make is misidentifying and misvalidating resistor color codes or other parts values which are clearly marked.

I followed the instruction manual, and found that the presorted components helped speed construction. All components were placed with ease—even polarity-sensitive capacitors, ICs, and transistors were plainly marked as to orientation on the top of the circuit board. Such a quality PC board makes errors avoidable if you take the time to read and look at parts identification on the board and in Ramsey's literature.

There was confusion regarding only one part in the kit—a varactor diode's correct orientation, the cathode/anode positioning on the board. While the board was clearly marked with which end was which, the diode was not. To verify which lead was the anode, I used my bench VOM meter. With most ohmmeters, you should use the x10 scale (current-limited) and the meter's red lead on what you think is the anode. That's positive side of the diode to the red lead and the cathode to the black lead (negative). The diode should indicate a few hundred ohms: if not, reverse the diode. When you get a reading of a few hundred ohms, you know which end is the cathode, as it is on the black lead of the ohmmeter in this simple test. Reversing the meter leads, there should be no indication on the ohmmeter.

To prove your test is accurate and that your meter is positive on the red lead, grab any marked diode, put the black lead on the cathode and the red on the anode, and verify a reading of a few hundred ohms. See **Fig. 3**.

This was no big deal. Only one part, and minor confusion solved by a simple ohmmeter check. Even if the diode were inserted backwards it would only have disabled the frequency tuning control. A simple voltage check on the diode side of R8 would prove a fixed voltage of 0.6 volts when the diode was reversed on the board. When the diode is mounted correctly, the voltages will read from zero to six volts when the tuning pot is rotated.

A minor problem, but one that will not cause things to "go up in smoke" when power is applied. Give the PC board a good going over for solder bridges and clippings from component parts before proceeding. Make sure that the DC power input is free of shorts by using the ohmmeter, again on the x10 scale. Check the DC 9 V input leads and turn on the power switch. The ohmmeter should indicate low resistance and then rise to a much higher reading. What is changing is that the electrolytic capacitors are charging and the ohmmeter, in a few seconds, should be in the kΩ ranges. Now you're ready to apply power and check out the receiver.

I used my old URM-25 signal generator to verify operation and sensitivity at 30 MHz. Both receivers constructed performed as advertised, and sensitivity was less than a microvolt for full quieting. Follow Ramsey's instructions and all will be well. My two receivers worked right from the start. The only adjustment was L4 for audio output and L3 for proper frequency range adjustment. Ramsey thought of everything: They even provided a tuning tool to make the adjustments. What a kit! All I had to provide was my time and some solder!

Once I adjusted the RF frequency oscillator coil, I wanted to see how well the onboard RF preamplifier functioned. Was I surprised that the sensitivity was in the tenths of a microvolt for full quieting! There was some pickup of commercial FM broadcast in the 88 to 108 MHz range on very strong local stations. I had observed this before with other systems—even the TDA7000 circuit design, years ago. Note that at this stage of testing I have not placed the receiver and modulator into a metal cabinet, which is necessary from a shielding standpoint. Any receiver that is going to be co-located on a hilltop with commercial high-power radio and TV transmitters can get into trouble if shielding is not used. If you use good shielding techniques, interference will be minimized.

I can't give more importance to shielding and to proper lead bypassing with feedthrough capacitors. All power leads that leave the cabinet should be tied through a feedthrough capacitor, not a rubber grommet. This goes for the hot speaker lead as well. With a metal cabinet and feedthrough capacitors used, the interference from commercial FM was eliminated.

Modifications for wideband FM

There are modifications that need to be made once you have determined that your receiver is operating properly. These modifications are necessary for greater bandwidth than the receiver comes stocked with. The conversion is simple and includes removing FL2 (450 kHz filter) and replacing it with a 0.01 μF disc capacitor. This makes the passband about 100 kHz wide. Shunt resistor R14 (33 kΩ) with a 3.9 k on the bottom of the PC board. This further broadens the passband to about 200 kHz.

The original tuning range of the FR-10 is about 5 MHz wide. We need to reduce this to about 500 kHz, centered at about 30 MHz. Remove C12 (56 pF) and replace it with a 15 pF disc capacitor. A second 15 pF disc capacitor is added under the PC board, shunting across L3, the oscillator coil.

To add finer frequency tuning, remove 10 k pot R10 and replace it with a 10-turn 10 k pot and calibrated readout dial for really fine frequency adjustment. Also, my headphones did not fit the headphone jack that was supplied with the kit, so I just jumpered the bottom of the board to a panel-mounted jack to fit my mike/headset connector.

The PC board was fitted with four standoffs to position it off the chassis by a small distance. The cabinet was connectorized with different connectors for each of the termination leads to avoid connecting the wrong device to the wrong jack. For instance, I used a two-connector cord for DC power, and bypassed the leads inside the cabinet with feedthrough capacitors. The headset has both a miniature one-eighth-inch connector and a standard quarter-inch stereo connector. This allows a

Number 42 on your Feedback card

HOMING IN

Radio Direction Finding

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homingIn/]

Mobile T-hunting, international-style

"Won't you run out of topics?" That's what a former editor of *73 Magazine* asked when I proposed a monthly column on radio direction finding (RDF), better known as foxhunting. It's been over 10 years since then, and there are more potential topics than ever. If RDF is one of your ham radio interests, you can always find something new to do. There are projects to build, noise sources to eliminate, jammers and bootleggers to catch, wildlife to track, aircraft ELTs to locate, and hidden transmitters to find.

Recent "Homing In" columns have emphasized foxhunting under International Amateur Radio Union (IARU) rules. This on-foot sport, which usually takes place in large forests and parks, is called foxtailing, foxteering, ARDF and radio-orienteering. Many clubs in North America are adding it to their hidden transmitter hunting activities. They are looking for ways to get T-hunters out of their cars and into the woods once in a while. One way to do that is to have mobile T-hunts that follow the foxtailing format, but with foxes spread out so that hunters can drive to them, at least most of the way.

I first heard about mobile versions of international-rules hunts from hams in Australia. (They call it CarDF.) Jay Hennigan WB6RDV and Dennis Schwendtner WB6OBB of Santa Barbara, California, were probably the first stateside hams to try it. According to the report from Marvin Johnston KE6HTS, everyone thought it was fun. So I decided to give it a try when it was my duty to put on the First Saturday Night T-hunt here in Fullerton last September. April Moell WA6OPS, Tom Curlee WB6UZZ, and David Curlee KE6IPY helped out.

Not enough transmissions

IARU foxtailing rules call for five transmitters on the same frequency, each transmitting a simple MCW message for one minute in sequence. Fox #1 sends MOE MOE MOE for 60 seconds; then it goes off and #2 sends MOI MOI MOI for 60 seconds. Then #3 sends MOS MOS MOS, and so on until #5 goes off and #1 immediately starts the sequence over again. That's the way my five Ts were programmed. Even without knowing Morse, it's easy to determine which T is on the air by counting dits.

In radio-orienteering, the goal is to walk or run to all foxes, then get to the finish line first and within the time limit, usually about two hours. Late arrivals are disqualified. For this First Saturday mobile hunt, which is traditionally scored by odometer mileage, we announced that the winner would be the team that had the lowest mileage among those finding the greatest number of Ts. Mileage would be taken at T5, so teams had to find it last. The others could be found in any order. All Ts were programmed to shut off at midnight, exactly five hours after the start of the hunt. Teams not reporting to T5 by then would be disqualified.

Traditional southern California mobile T-hunts are both a "hider versus hunter" and "hunter versus hunter" game. The hiders do their best to foil the hunters using mountain bounces, not-on-the-map fire trails, camouflage, and so forth. But an international-style hunt is supposed to be a competition only among hunters, not between hiders and hunters. It's intended to teach hunters to take bearings carefully, plot them, plan an efficient route, and execute the plan.

In that spirit, we made every effort to have the hiding spots be relatively easy to find, with none of the usual signal tricks. All Ts were copyable at the starting point, though it was necessary to move around the start hilltop to get optimum signals on all of them. The fox boxes were right next to roads accessible by passenger car, except for two that were in public places less than 250 feet from roads. All of them were within 11 airline miles of the start.

The clear lesson from this hunt was that IARU's fox timing is not optimum for mobile T-hunting. The one-minute-on/four-minutes-off transmission ratio gives only 12 transmissions per hour per fox. Only one team found all five foxes, but arrived at the last fox 10 minutes after the midnight deadline. If we do it again, we will use a 12-seconds-on/48-seconds-off cycle for each fox, which will

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choice between using a mini headset or my dual padded stereo headset for noisy locations. The mike jack is a standard three-pin miniature of different size than the receive headset jacks, avoiding confusion.

The modulator that provides DC power to the diode is fed via coaxial cable and appropriate connectors to easily tell the voltage supply from the detector (receiver diode). I used a BNC on the voltage connector and an SMA for the input to the Ramsey FR-10 30 MHz receiver. This further avoids confusion when in a rush to get on the air. You cannot make a wrong connection ... unless you use a pipe wrench!

What is my recommendation on the Ramsey Electronics FR-10 30 MHz receiver kit? If you are interested in 10 GHz or even 24 GHz wideband operation, this is a most inexpensive kit that performs even better than I expected. You cannot ask for better value in a kit. Ramsey even tossed in the alignment tool, to be sure you could adjust the two coils in the kit properly. That in itself shows that Ramsey should be proud of the kits they produce. The FR-10 comes not only with a quality PC board, but also with tools and easy-to-follow instructions to ensure that the kit will function as advertised.

I constructed two kits. Both were simple to assemble and both functioned better than I expected. Sensitivity was a key issue and the 0.2 microvolt sensitivity for full quieting of the receiver at 30 MHz was very impressive. Order your FR-10 receiver kit now and be ready for the completion of this project in Part 2 next time. Ramsey Electronics is located at 793 Canning Parkway, Victor NY 14564. Their order phone is 1 (800) 446-2295, while questions or order status handling is available at (716) 924-4555.

Next time, I plan to complete this transceiver and cover the interface of the receiver and the transmitter modulator circuit. The bottom line is that this receiver can be interfaced with either a 10 GHz or 24 GHz oscillator/detector cavity for great wideband FM fun. 73, Chuck WB6IGP.

give hunters a chance to get a bearing on each one every minute.

The winning team was Clarke Harris WB6ADC and Richard Clark N6UZS. After the hunt, Richard explained, "We found T2, T1, T4, and T5, in that order. After four hours, we were really close to T4 and decided to forget about T3 so we could get to T5 by midnight. We figured it would take 30 minutes to drive, plus sniffing time, so we were moving really fast."

Ghosts and goblins to track

Another ham who has discovered radio-orienteering and wants to get mobile T-hunters to try it is Bonnie Crystal KQ6XA of San Mateo, California (**Photo A**). Her method was similar to mine, but her execution was far more creative.

Last October 31, Bonnie put on the monthly Pack-a-Lunch T-hunt in Fremont, California, near San Jose. Considering the date, a Halloween-theme hunt was most appropriate. In doing it, she gave hunters something they had not done before, but made it fun for everyone. According to long-time hunter Jim Sakane KD6DX, "It was one of the most elaborate and finest T-hunts I have ever participated in."

Photo A. Bonnie Crystal KQ6XA holds one of her six Halloween fox transmitters and the fake campaign sign that concealed one of them. (Photo by Jessica Stevens.)

Although new to hidden transmitter hunting on the ham bands, Bonnie won both of her first two T-hunts, making it her responsibility to be the hider that month. "I've used both low frequency and VHF direction finding for many years for other radio operations," she told me. "Now I wanted to start off hiding with a splash. The hunters had no prior knowledge of the style of hunt to expect. All my preparation was done in complete secrecy. The only indication I gave the week before the hunt was that I was working on a T, and hoped to have it together in time for the hunt."

Seven teams assembled at the starting point, waiting for Bonnie's signal to appear at 10 AM. At the appointed hour, her voice appeared on the local repeater, telling the hunters to check under nearby rocks for instructions. Ron Susztar N7TVE was first to spot the stack of papers containing a cryptic poem (see *Trick ... or Treat?*).

The poem disclosed nothing about boundaries of the hunt area, nor did it reveal how many transmitters there would be. But hiders who had read about international-style foxhunting realized that this method of signaling and identification would be followed. Besides the MO designations, Bonnie helped the hunters distinguish between transmitters by giving each one a different CW tone pitch. To add to the intrigue, some of the transmitters also played sound effects, sounding like a haunted house. Others had sensitive microphones to cause audio feedback as hunters approached with their handie-talkies on.

All of Bonnie's fox boxes used PicCon controllers (see "Homing In" for March 1997), programmed to start and stop the transmit sequences automatically. Only two of the foxes (T1 and T2) came on the air at the 10 AM start time. T2 (MOI) was cleverly concealed inside a steel post just 100 feet from the start point in a vacant lot (**Photo B**). It put out only one milliwatt and the antenna was a one-inch bolt! T1 (MOE) was about a quarter-mile away, running 10 milliwatts into a quarter-wave whip. Both of them shut down after one hour.

Jim Sakane wrote, "The instructions stated, 'Why walk away from your listening posts?' So I decided to stay and get accurate initial bearings. Lucky I did, as I found the MOI transmitter in the fence post, with a microphone. I kicked it by accident and everybody heard it on their two-meter radios."

After that, it was off to find T1, which was emitting ghoulish sound effects. Bonnie had

Photo B. Ron Susztar N7TVE is amazed that fox #1 is somewhere inside this fence post! (At least that's what his RDF equipment indicates!) (Photo by Jim Sakane KD6DX.)

Trick ... or Treat?
A Halloween Transmitter Hunt

by Bonnie Crystal KQ6XA

Strange and mysterious! From another dimension!
This little hunt takes all your attention.
A fox of a witch waits for you to arrive.
The radio, it's haunted on 146.565!

The mind plays tricks and fools the eyes;
Believe your equipment—it never lies.
"Always trust your initial bearing,"
You might go astray when you're feeling daring.

Why walk away from your listening posts?
Clues will be there in spite of the ghosts.
Point your antennas and tune your receivers,
The path to the fox isn't paved with deceivers!

"How many," you ask, "will there be to find?"
Quite enough just to drive you right out of your mind!
Who are "MOE," "MOI," and the rest?
Just a fox in the trick-or-treat transmitter nest.

"MOE" is one and "MOI" is two,
"MOS" is three, on and on like a zoo.
Will "MOH," "MO5," maybe more appear?
Keep your ears open for what you can hear!

Always save your special li'l wrappers,
Or you'll wind up like li'l morning nappers.
If you're a-fakin' or you've been mistaken,
The witch will object to some goodies you've taken!

Get back to the start point for eleventh the hour ...
When witch casts her spells with even more power!
Then fly like a bird to the witch's lair,
When the clock strikes three, make sure you are there!

Photo C. Hmmm ... An ammunition can with antenna atop a sign board. And the signal is really strong! Can this be fox #3? (Photo by KD6DX.)

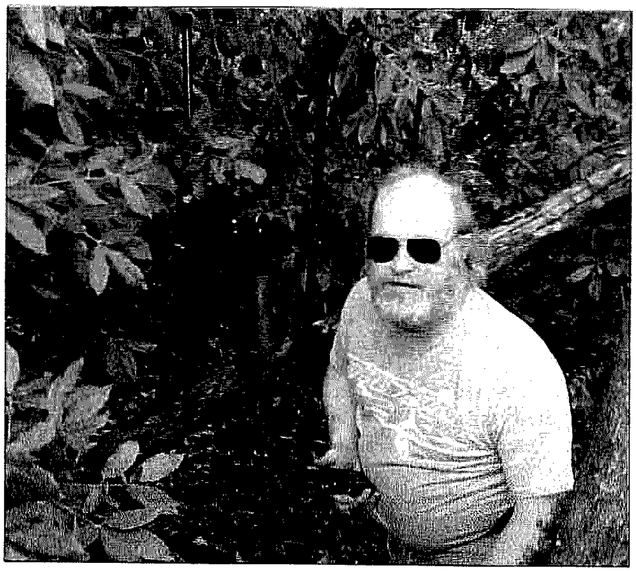

Photo D. Rich Harrington KN6FW just found fox #4 deep in the woods. Its beam antenna caused the signal to bounce from a mountain to the north. (Photo by KD6DX.)

taken advantage of the sign clutter that decorates the fences of most California vacant lots at election time. T1 was inside her own fake campaign sign. T-hunters can be mesmerized by watching their sniffing devices, so they might have missed the fact that the sign read "RE-ELECT FOXX." The fine print underneath was "Paid for by Californians for Bay Area T-Hunts Committee."

Instead of the traditional sign-in sheet, a bag of Halloween candy was near each of Bonnie's foxes. Each bag had a different brand of candy bars. Hunters were expected to eat one and save the wrapper, to be turned in as proof that they had found that particular fox.

According to KQ6XA, "It took them the entire hour to find T1 and T2. Our video tape shows them walking around in circles and then walking away several times, totally befuddled."

How many more?

At 11 AM, T1 and T2 disappeared from the air, replaced by T3 (MOS) and T4 (MOH). Both were about 25 miles away, on the west side of San Francisco Bay. "Many hunters searched the same area on foot for T3 and T4 at first," Bonnie reported. "Their signal strength was similar to the earlier ones, due to their much higher power and high location."

"The MOS signal was very loud," KD6DX wrote. "I sometimes received it full-scale. I drove around the start point area and the direction did not change at all. This told me that it was not close. Greg Ottria KE6PTP and I headed off the hill to catch Highway 101 near Mountain View. We picked up lunch in Sunnyvale and continued north, ending up on Skyline Boulevard."

Upon exiting their vehicles, most hunters quickly spotted an ammunition box with whip antenna sticking out, fastened to a "Trail Closed" sign (**Photo C**). They grabbed a candy bar from the bag next to it and headed off into the woods to look for the source of the weaker MOH signal. "T4 was a little harder to find," KD6DX reported. "I had a lot of signal reflections and didn't know where to go. KE6PTP and I walked up a trail until the sniffer pinpointed it below trail level (**Photo D**).

Jim continued, "As we took the Mr. Goodbar® candies, Bonnie walked up behind us in her witch costume. She asked if we had finished looking for the three to eight transmitters. We gathered from her cryptic statement that there were more foxes to hunt. With careful attention, we discovered that there was a third signal mixing with the strong MOS and MOH sounds coming from our receivers. We got into our cars and headed north on Skyline, where the mixed signal was getting louder and stronger than T3 and T4. We parked our car in a bike trail parking lot and hunted the mixed signal, which turned out to be T5 mounted on the back fence.

"At that time we heard still another signal mixing in," Jim added. "With all these foxes transmitting at the same time, we were getting pretty confused. I discovered that the closer you get to even a weak transmitter, it will eventually overtake a strong transmitter. Rich Harrington KN6FW was the only person to go after T6. He found it about 300 feet up on a ridge overlooking the parking lot."

As the hunt ended at the stroke of 3 PM, all hunters gathered in the hilltop parking lot. They turned in their candy wrappers and waited to find out who had won. But first, Bonnie had a surprise for some of them. She opened the ammunition can—the one that was on the ROAD CLOSED sign—to reveal nothing but some heavy rocks! It was a decoy.

The real T3 was heavily camouflaged in nearby brush with its circularly-polarized yagi antenna pointed to the starting point. The decoy box was directly in the signal path. Anyone who turned in a wrapper from the decoy was penalized by having one fox deducted from the team's score. By the way, the candy next to the decoy was aptly named "Trix®."

KN6FW was the undisputed winner of the hunt. According to Bonnie, "He turned in all six wrappers from the real foxes and was smart enough to keep the decoy candy wrapper in his car. His mileage was lowest also. On the other hand, the worst mileage was over 100 miles. One hunter chased the mountain reflection from T3's beam to a mountaintop area above Oakland about 25 miles

QRP

Number 45 on your Feedback card

Low Power Operation

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How many hours have you spent working on the finer details to peak the front end of a QRP receiver? Then, after hours of work, you connect your dream rig up to a ho-hum audio amplifier. Kinda trashes all your work, doesn't it? Well, this month we'll take a closer look at some of the many different audio amplifier chips available to the home builder. We'll also look at the old standby—the LM386.

Keeping it simple

Everyone likes to keep things simple, no matter what the project. However, in an audio amplifier, sometimes simple is the not the best way to go. I guess it all depends on what the end product will be. If you're only after enough audio to drive a pair of walkthing headphones, then you can get by with a few resistors and a couple of 2N2222s! If you want to enhance your audio so you can listen to the rig for hours on end, then you'll have to come up with something a bit better.

Set up some guidelines

If you are working on the audio section of a receiver, you should put some design goals on paper. If, for example, you're going to be using the receiver (or transceiver) for portable use, then current consumption is rather important. Likewise, if you're planning for portable use, do you really need a two watt output amplifier? While you and your family may like CW in the background while you camp, those of us around you may be camping to get some peace and quiet!

Another guideline is the amount of space, and thus the part counts needed to produce your desired output. If you're building a super-small rig, then you'll have to design your audio section using the minimum number of parts. In this case, perhaps the use of surface mount components may be required. And if that is so, then you once again have to look at the output power you can safely pull out of an SMT audio amplifier. On the other hand, if you're planning on building a rig that will never see the green grass of a national park, then you may want to go with lots of audio. If that is the case, there are many hybrid ICs that have very low internal distortion numbers. We'll look at a number of these chips in a moment.

As home-brewers, we can take advantage of some of the specialized audio IC chips that have sprung up from consumer goods. There are audio ICs that support up to five watts of very clean audio. In addition, you can double up the power because these chips also produce great-sounding audio. To really make things more interesting, some of these specialized audio chips have an onboard attenuator. You can remotely control the volume by varying a DC voltage instead of running audio around your chassis! Although most of this is overkill for most of us, the technology is there nonetheless. Let's get going!

The LM380N

The LM380N is an audio amplifier in a 14-pin DIP package that requires very few additional external components to make a complete 2.5 watt amplifier. The gain of this IC is fixed at 34 dB. The LM380N chip has a unique input stage that allows inputs to be ground-referenced. The output is automatically self-centering to one half the supply voltage. The LM380N has output short circuit protection with internal thermal limiting. Since this chip has the internal thermal heat sink connected to the middle pins, it allows for easy heat sink design using the PC board traces.

The LM388

This audio chip is very similar to the LM380N. The gain is internally set at 20 dB. However, by changing a few external components, (a resistor and a capacitor between pins 2 and 6), the gain can be increased up to 200 dB. The inverting/non-inverting inputs are ground-referenced, while the output is automatically biased to one half the DC power supply voltage. The LM388 will operate with low distortion all the way down to 4 VDC.

The LM384

If you're looking for something to rock your neighbors, this is the one that will do it! The LM384 will produce five watts. Having the same 14-pin configuration, you could swap out this chip with either the LM380 or the LM388, with minor pin changes on your PC board.

The LM386

Here's our old friend! Primarily, this chip is designed for low-voltage, battery-operated applications. With pins 1 and 8 open, circuit gain is internally set to 20 dB. With a 10 µF capacitor between pins 1 and 8, the gain is then set to 200 dB. The gain of this chip can be set to just about anything in between these two levels by adding a resistor in series with the capacitor connected between pin 1 and pin 8.

The TDA2040

Here is a chip that will also rattle your windows with its 20-watt output. The TDA2040 is in the five-pin SIL (single inline) package. It's a good thing that

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away on the east side of the bay and eventually gave up, notifying the hunt group via a repeater."

As I have written before, I think the best hidden transmitter hunts include surprises. Bonnie certainly fulfilled that mission, and she gave the Pack-a-Lunch bunch a good introduction to international-style foxtailing in the process. KD6DX proclaimed, "I think Bonnie and her helper Jessica should be given a five-star rating and made the exclusive fox for all Pack-a-Lunch T-hunts. But Bonnie, it doesn't have to be this hard every time!"

Bonnie and her friends are also planning some all-on-foot foxhunts following international radio-orienteering rules. She hopes to put together a team to compete at the 1999 Friendship Radiosport Games (FRG-99) foxhunts in Portland, Oregon, this coming August. As I reported last month, competitors from Russia, Japan, Canada, and perhaps other countries are expected to attend this event, which has been designated as the first IARU Region 2 ARDF Championships.

For more information on how you and your fellow hams can hold international-style foxhunts and participate in FRG-99, visit the "Homing In" Web site, URL above. If you haven't succumbed to the lure of the Web, send a self-addressed stamped envelope to my postal address above and I'll send you the information by return mail.

Number 46 on your Feedback card

ON THE GO

Mobile, Portable and Emergency Operation

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A value statement

There's a saying, often attributed to Henry Ford, that goes something like, "Whether you believe you can, or you believe you can't—you're right." There is a lot of truth in that. We tend to achieve what we believe we can achieve.

Sometimes, for example, I hear from other amateurs that they have been intrigued by mobile or portable operation, but feel that it is too expensive. In fact, most of us have heard of prospective hams who are interested in the hobby but don't pursue their interest because of this perception that it is prohibitively expensive. This may be one of the most inaccurate assumptions we face today.

I may not have the best-equipped ham shack in the world, but I've got equipment that suits my needs and provides the capabilities I'm interested in. Alongside the computer monitor sits my low-band rig and a two-meter transceiver as well as my TNC, which allows me to communicate not only by voice or CW but also by packet, teletype (RTTY), and slow scan TV (SSTV). Almost all of the components were purchased new and cost around $1500 total.

I know what you're thinking: I just proved your point that amateur radio is a very expensive hobby. But wait a minute. I did not purchase all of this equipment at one time, but added, upgraded, and traded up over the years. These are the latest acquisitions that I have, and except for the digital power/SWR meter (bought on a closeout for $20), the other equipment is between 13 and 16 years old.

It's interesting to note that the prices for today's comparable pieces (which do have a few more horns, bells, and computerized whistles) are about the same in actual dollars as they were for my equipment when I purchased it. Yes, I'm talking new, second- or third-tier-from-the-top equipment. This means that an excellent high-frequency rig can be purchased for less than $1000, and a medium-powered VHF transceiver for less than $500.

Again, this may seem like a lot of money, but there is one other factor. Remember how I mentioned that my station sits next to my computer? These days a computer seems just as necessary as a telephone. Obviously, "the kids need it for school." My older son typed one school assignment for every gazillion hours of computer games he played (and he's now majoring in computer science in college), so I wonder about that line of logic. For whatever reason, a computer is considered a necessity.

Since I bought my current HF rig in the mid-'80s, I have had an 8080-based computer, a 386-based computer, and a Pentium® and a K-6. These computers cost an average of twice what my rig cost, not counting upgrades, additional memory, and consumable supplies. It is well acknowledged that we go through a computer generation every 18 months. So, since the '80s we've been through the 8008, the 286, the 386, the 486, the Pentium, and the Pentium Pro. And you can only upgrade a system so far before it has to be replaced, because new software won't run on most previous platforms.

On the other hand, an amateur rig represents a great value. Figuring the cost over time, my HF rig has cost me just over $100 per year, while my computers have cost me over $600. Have I gotten 21¢ value from my HF rig per day? Yep. Can I still use all the modes? Again, affirmative.

Some folks may prefer to look at the cost as cash flow rather than calculate the value over time. The initial outlay of money may be the concern. I fully understand that issue as well, especially as it relates to mobile or portable operations. After all, if you have a decent rig at home, the mobile may represent a duplicate expense. That's why we have hamfests.

My mobile rig was purchased at a hamfest and included the rig, microphone, a 20 A power supply, and a phone patch—for between $200 and $300. If I had been so inclined, I could have sold the patch and power supply to further reduce my cost. If I had been faster to react at that hamfest I could have picked up a multiband Outbacker antenna for less than $100.

Odds are that most automobile-mounted two-meter rigs cost more than $300–$400 if you include the antenna. So, all things

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this chip has a built-in over-temperature shutdown. It has internal short circuit protection, too.

The TDA7052

Here would be a good chip to replace the tired LM386. This one-watt mono amplifier is bundled in an eight-pin DIP package. The TDA7052 features internal short circuit protection, low power consumption, and good overall output stability. No external components are required for circuit function. There is no need for an external heat sink for its rated one watt output power.

There's not enough room to publish the pinouts of each of these chips, but any good reference book will do. I used the one by National Semiconductor.

Tidbits

Are you a member of the ARRL? If so, check out the new members section of the League's Web site. They are at [www.arrl.org]. Once you've entered the members-only section, check out the review of the SGC2020 rig. You can listen to the rig in both CW and in SSB. You'll need the Real Audio player plug-in for your Web browser. That's not a problem, as you can download the plug-in from the ARRL site.

You may want to check out my Web site, too: [www.seslogic.com]. I'll be installing some links to some of the QRP sites. Have you ever wanted to check out what is happening with your QRP buddies on the QRPL reflector? But you don't want to mess with subscribing to the news reader? Then point your Web browser to: [www.qth.com/stamper/search/bafoof.htm]. There you'll find lots of interesting stuff. There's a UALR lookup, QRZ, and Buckmaster callsign lookup search engines.

But what I find the most interesting is the ability to view reflector postings of the QRP, Topband, CQ-Contest, and Tower Talk. You can view and search reflector archives, too.

There's also an active DX cluster site for all the HF ham bands. Why, there's even Telnet Packet Gateways on the site! This is a slick way to keep in touch with other QRP operators—check the band conditions while you search for DX from the cluster gateways.

Number 47 on your Feedback card

The Digital Port

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Budget portable/mobile digital

Some of you have wondered, I am sure, when I was going to take the SSTV, RTTY, etc., down the road. I finally did it, and it is well worth the effort, considering the time I spend away from home.

The only missing element I needed to come to grips with was a mobile antenna. The stores and ham magazine ads offer many choices, and I looked at them. There is nothing wrong with buying ready-to-bolt-on equipment. It is well worth the money. Ham equipment is a bargain when you consider that the experimenting is pretty well done by the time you buy it.

But you faithful readers know me better than that. If it can be made by a pair of human hands, surely I can do it as well. Just seems to be an attitude, and if it hasn't been cured by this time in my life, it is without doubt a hopeless case. Besides, these are learning exercises. No one should leave this earthly existence without a knowledge of mobile antenna fabrication.

Just a quick aside: Today, when I made the first 40 meter contact to get a report on the antenna, I hooked up with Dave W7DE in Palo Alto, and Forrest K6HY, who is a bit farther north in California. These hams told some old war stories about mobile antennas of yore that were not only educational, but also helped put some of my recent efforts into perspective.

Here's a quick rundown on the project. Though it is successful, I feel the dimensions are not quite ideal. Therefore, I won't give exact measurements lest you copy them and end up with a less than perfect product. What I am saying, simply, is that after careful adjustment I have an antenna with a relatively high SWR that requires an antenna tuner.

This is okay by me, since any mobile antenna, other than the constantly variable "screwdriver" variety, requires a tuner to work more than a narrow segment of the band. I have a theory, and don't take this as "from the horse's mouth," that the reason you can get good signal reports from these dinky little antennas is that the vehicle is part of the radiating device. I hope I don't draw criticism on that point, but it makes sense. How else can we explain great performance from a sixteenth-wave whip?

This budget mobile antenna costs less than $20 to assemble. The real problem with saving money is that you have to work for it. The first part was fairly simple. I purchased a scrap of half-inch PVC for less than a buck to use as a coil form. To go with that, I picked up some 14-gauge copper wire for about 15¢ a foot, another $3 or so.

An idea was forming about spacing on the smooth surface. I calculated the number of turns I wanted on the form, chucked the pipe in the metal lathe, and cut a shallow thread along its length at six and one-half threads per inch. That made winding a neat coil easy.

The standard thread dimension for mounting mobile hardware is three-eighths diameter at 24 threads per inch. I wanted to use that standard because, in the end, it might prove prudent to purchase a commercial stainless steel stinger. Real-life reasoning showed this to be wise because, for the experimental version, the stinger was first made by welding three pieces of eighth-inch gas welding rod end-to-end.

Vertical with a droop!

This was brazed to a short bolt with the proper threads, and an interesting phenomenon raised its head. Though this work of art appeared fairly straight, when it was held vertical, the top drooped over like a wilted flower. This was remedied by slipping about 50 inches of quarter-inch steel tubing over the bottom half and brazing it at both ends.

Also, after realizing this relatively stiff assembly could strike some low bridges, the length was reduced to seven and a half feet. A three-eighths nut was ground to a press fit and epoxied into the top of the coil with the coil wire attached during this operation. This made one end of the antenna complete.

The other end of the coil needed a coax fitting. This was accomplished by fitting and pressing a barrel connector into the coil form with the proper connections in place before applying epoxy. This project was taking shape rather nicely—nothing to this home-brew stuff.

Then came the rude awakening. There was no easy way to mount this contraption with readily available hardware. I was going to have to roll my own.

After a quick search through the scrap bin, the only material that was close to what was needed was a piece of half-inch aluminum plate. Sounds simple, except that this was 7075, about the toughest aluminum available. It is nearly indestructible and, consequently, difficult to cut. Still, it was the best quick choice.

Brackets were formed to clamp to the upper and lower ends of the coil and mount to the curved side of the van. That curve can really mess with your mind. Inside of a foot, there is a three-inch variation from vertical. I learned this when attaching other appliances to the inside of this old van. If you ever decide to build your own RV, take it from me: Build it into something shaped more like a shoe box.

After getting through all the tough details of forming this aluminum and getting it mounted to the side with some

Continued on page 50

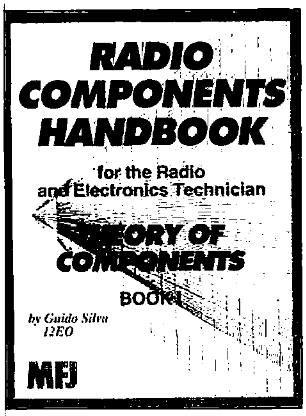
considered, the price is nowhere near as prohibitive as you might think to operate HF mobiling.

And what do you get in return? First, you're not limited by repeater coverage, and many HF mobile operators have maintained a contact over a distance of a hundred miles. Sure there's some signal fading, but not much more than I experience with my fixed rig at home. Ragchewing with a foreign station seems to make a trip seem much shorter than a similar discussion on a local repeater. Plus, you're not tying up a repeater frequency in the process.

If you read this column regularly, you know that I have a passion for emergency and disaster communications. Think about how much more you can contribute with additional bands at your fingertips in the car.

Think about it. It just might be something you want to consider. If you do, drop me a line and let me know about your experiences. I enjoy hearing about different aspects of the hobby and passing them along. Even though we provide a lot of public service, ham radio is, after all, a hobby, and thus mainly a whole lot of fun.

New Products

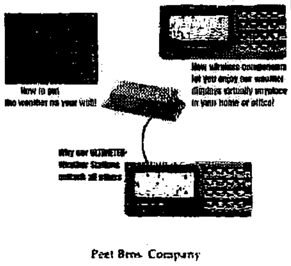


Radio Components Handbook

The full title is *Radio Components Handbook for the Radio and Electronics Technician. Theory of Components, Book 1*; by Guido Silva I2EO. Engineers, technicians, amateur radio operators and students will find direct, clear needed information in this handbook about inductors, loops, transmission lines, capacitors and more. Scores of formulas, graphs and practical construction details are included to make this softcover book a handy take-with technical manual. The author, Italian amateur operator Guido Silva I2EO emphasizes the building of circuits and parts with over 100 full-page graphs.

See your ham radio dealer or look for *Radio Components Handbook* (MFJ-3508) wherever you buy books, or contact MFJ Publishing for more details: P.O. Box 494, Mississippi State MS 39762.

The world's best affordable Weather Stations

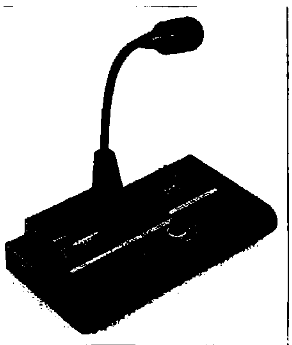


Doing Something About the Weather?

Well, they're making it a whole lot easier to deal with ... the folks at Peet Bros. Company, I mean. You can configure an Ultimeter system to provide you with exactly the weather information *you* need, from wind direction and flash flood warnings to temperatures and humidity levels.

Other new products from Peet Bros. allow you to post local weather data on your home page, store the data at five-minute intervals for up to a month before transferring it to a computer file for display and analysis, and monitor the weather remotely. Yes, you can check the weather at your cabin or the marina or wherever ... before you load up your vehicle with all the wrong gear!

Whether you have a hobby interest in weather or a multi-million dollar corporate requirement to keep track of the weather, Peet Bros. is the company to call. You can reach them by phone at (800) USA-PEET (872-7338) or at (732) 531-4615. FAX them at (732) 517-0669 or E-mail them at [peetbros@peetbros.com].

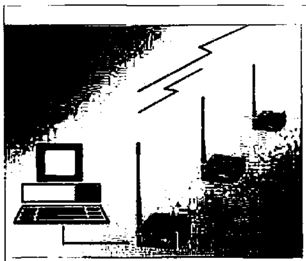


The Adonis of the Airwaves

Sound coolly professional with the AM-7500E amplified desktop mike. The four-band graphic equalizer provides tone control over your transmitted voice, while the three-stage speech compressor and audio amplifier control the strength and consistency of your transmitted audio. You'll also find that Adonis USA's AM-7500E has a highly sensitive electret microphone element, output level control, momentary and locking PTT switches, battery tester—and more, all in a sharp-looking anodized aluminum body with metal gooseneck mike.

The AM-7500E is powered by AA batteries (4), an optional DC adapter (model PS-6A) or directly by some radios. It uses Adonis adapter cables, available separately, to connect to your transceiver, making switching radios a snap. All this and a full one-year warranty for $269.95!

For a free catalog with all features and specs, write to Adonis USA, P.O. Box 1124, Issaquah WA 98027; call (425) 558-9592; FAX (425) 558-9704; or E-mail [info@rflimited.com]. Check out the Web site at [http://www.rflimited.com].



Neulink 9600B Wireless Networking Base Station

RF Neulink announces low-cost, reliable, intelligent wireless networking with its microprocessor-controlled base station, the Neulink 9600B. The 9600B is offered in both the UHF and VHF ranges, and is designed to communicate through its RS 232 port to a local computer or other intelligent host devices. Network address information and data are sent to the base station via the RS 232 serial port. The Neulink 9600B base station puts the data in a packet along with a packet identifier, a destination address and a 16-bit CRC. The packet is then sent over the air at 9600 BPS to the remote network of Neulink 9600s. All over-the-air communications, including error checking and correction, transmission retries, address verification and duplicate message checking are handled by the proprietary over-the-air protocol, and is transparent to the base computer and the remote devices. A remote network of up to 65,000 Neulink 9600s are intelligent two-watt synthesized transceiver modems with 64 programmable RF channels, and a store and forward repeater capability.

For more information, contact RF Neulink, 7610 Miramar Rd., San Diego CA 92126. Call (800) 233-1728; FAX (619) 549-6345; or E-mail [rfneulink@rfindustries.com].

Back by Popular Request!

The hams at HAL proudly announce the all-new DXP38, featuring the DSP power of the P38 and the tuning indicator style of the RTTY-1. The DXP38 includes fully-adjustable Mark, Space, and Shift settings in FSK and the higher speeds of CLOVER-II. As with all HAL products, you don't pay extra for software. In addition to our standard DOS-based terminal program, the DXP38 comes with a new Windows (95/98/NT 4.0) terminal program—all for $395.00 plus shipping!

The Digital Port

continued from page 47

angle brackets, it was time to run the coax. This was fairly simple, since I am at liberty to drill holes wherever I want on this vehicle. With an appropriate-size grommet in place, the business end of the coax was inserted through the side of the van and I was in business. (See **Photo A.**)

The next step was to determine where to place the taps on the coil. Out came the trusty Heathkit dip meter that had been gathering dust since the last major tune-from-scratch project. After finally getting the meter to dip in the middle of the 40 meter band, I became painfully aware that I should have made the coil a bit longer. That is why there is no list of absolute dimensions given here.

The next to last exercise was to plug the ICOM 735 into 12 volts and the antenna to check the SWR. The bad news: The best reading was about 3:1, with the built-in meter on the 735. I brought out a separate meter—same thing. I knew that 3:1 could be tuned out with a tuner, so I brought out the massive desktop tuner and, sure enough, it handles it nicely.

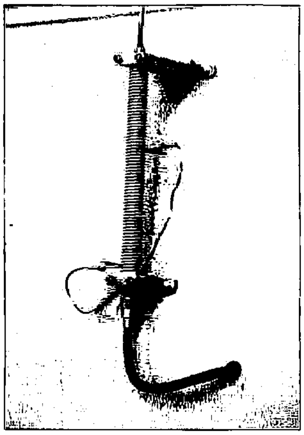


Photo A. This is the assembled mobile antenna with temporary clips in place for testing. The mounting was the most challenging task. The desired position, high on the side, required some effort to gain a vertical installation. The aluminum brackets were bored and cut, then threaded for clamp bolts. A weather cover is coming as soon as the project is completed.

The final test to determine if all this was worth it, if it was time to start over or scrap the whole project and go commercial, was to see if I could be heard. This was late evening time, there was a contest in progress and my little peanut whistle wasn't quite noticeable.

The next day, at the appropriate time, I drove away from the house and the side of the hill that so effectively shields me from some of my best ham contacts. With the van parked in the middle of the valley away from any obvious obstruction, I made the first contact with the new antenna and the signal report was very encouraging. The other operator was using a delta loop and the signal reports both ways were in the S8 to 9 category.

I decided to keep the not-so-perfect antenna just as-is and use it. Other priority projects were getting "behinder," and at least this works.

I learned at least one thing beyond the obvious problems faced when making do. One of those is that the grid dipper method of tuning an antenna has become pretty well antiquated. I have been reading the ads for the super antenna analyzers that are purported to tell all you need to know to get an antenna trimmed correctly, simply, and quickly. I need one of those if I am going to engage in such projects. (Maybe I should build one?)

Now, it is possible to be away from home and keep active contact in the various HF modes. I have not tried this antenna on 20 meters. The dip meter said it resonated there and on 15. I will have to load it with the tuner and see how well it radiates. If that makes it work, I will be a happy camper.

Speaking of digital amateur modes, the SSTV activity on 40 is drawing attention. I get E-mail telling me about new interest in the mode as well as those who would like to do SSTV on low power. I even ran across one ham who had tired of the usual propagation and interference problems who heard us on 7.190 during an early afternoon session.

He had become more enamored with the Internet even though he had assembled a respectable ham station. This leads me to a painful subject. This Internet is one of our greatest assets when it comes to reliable communication and data transfer, but it has become our greatest competitor for the challenging mind that was once best suited for ham radio activities.

The reasons are based around choices. Suppose you can explore what goes on in other lands by simply connecting to a server through a telephone line and running a search for that land, and you can do this immediately without passing any tests. (Some of the folks using the Internet should have to pass a test on common sense and courtesy, but if they don't have to pass any such test to get a driver's license ... well? Another subject.)

And our natural rebuttal as hams is that what we do is more personalized and we get to talk to the natives and make friends, etc. We say there is a challenge to using ham radio that shows what we are made of. Kids counter by saying they have plenty of other challenges already—they want some immediate action.

All right, so this is an old story and it goes on, back and forth, and no one really wins. Let's face it. It ain't about winning, it's about what we can do to make ham radio more fascinating to the up and coming generations.

The point I would like to make here is simply this. We have, at our fingertips, a most attractive package of technology that is disguised as an old fogey's hobby. Ham radio is much more than a ticket to purchase an HT and access the local repeater.

Think about just this one item. Kenwood sees it is necessary to put a little pizzazz in the HT FM mode, so what do they do? They build a great new digital camera that interfaces with their handhelds so SSTV pictures can be taken and, within moments, sent over the air to other hams in full-quality color. That is very nearly instant gratification, plus the ability to use one of the new technologies available in conjunction with ham radio.

It shouldn't be up to the manufacturers to design equipment that will bring new heights of interest to ham radio, but Kenwood has made a step in the right direction. That is the VC-H1. It costs money, about $500, but so does any of this hi-tech stuff, and people are buying it.

I still recall the professional programmer sitting in my shack watching a packet connection in operation. He was marveling at how this was being done with no connection through telephone lines. We can display the same fascinating stuff with all the digital modes.

Consider how you might impress your technically-oriented friends if they could see packet run over the air or, better yet, SSTV, RTTY, PACTOR or WEFAX. Think of the possibilities as you tell them, "... and you could do this and more. Do you realize that, as hams, we can make contact with our own satellites and pass some of these same kinds of messages back and forth through them? I would like you to get into this so we could do these things together."

And there lies a little secret. Most people aren't really loners when it comes to learning something new. They may be competitive and want to learn more and faster than one another, but that is the advantage of two people working together. Try it.

Of course, that may mean investing 30 or 40 dollars and getting into RTTY or SSTV, but that is generally within the range of those who read this column. If you will refer to **Table 1,** you

Number 51 on your Feedback card

Hams with Class

Carole Perry WB2MGP
Media Mentors Inc.
P.O. Box 131646
Staten Island NY 10313-0006

Famous folks

It is always nice to be in the company of accomplished, successful people. As amateur radio operators, we are all in the company of some very famous personalities. The kids in my radio classes always enjoy hearing stories about the many people from different walks of life who claim amateur radio as their hobby. Perhaps you can use the following information to enhance a lesson at school or to have fun with at a club meeting.

Writing to some of these folks may lead to some interesting experiences for you and your group. Be sure to let me know if you have a good success story to share.

KA7EVD Donny Osmond, who let his call expire—write to him

EAØJC King of Spain Juan Carlos I de Bourbon

HS1A King of Thailand Bhumiphol Adulayadej

JY1 King of Jordan Hussein I

IØFCG President of Italy Francesco Cossiga

K7UGA Retired senator Barry Goldwater, SK in 1998

LU1SM President of Argentina Carlos Saul Menem

W6EZV USAF General Curtis LeMay, SK in 1991

K4LIB Entertainer Arthur Godfrey, SK in 1983

KA6HVK Singer Burl Ives, SK in 1991

KI6M Comedian Stew Gilliam

KN4UB Rock musician Larry Junstrom

W6UK Musician/bandleader Alvino Rey

WA4CZD Musician Chet Atkins

WB4KCG Musician Ronnie Milsap

WB6ACU Rock Musician Joe Walsh

K2ORS Writer, humorist Jean Shepherd

K6DUE Retired NBC science reporter Roy Neal

KB2GSD Retired CBS anchorman Walter Cronkite

N4KET CNN anchorman Dave French

NK7U Retired Major League baseball player Joe Rudi

KB6LQS Pilot Dick Rutan

K1JT 1993 Nobel Prize winner Dr. Joe Taylor, Jr.

Information courtesy 1994 *CQ A.R. Almanac* via TSRAC *ARNB*.

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will find a number of opportunities to get involved in these fun activities—and they won't kill the pocketbook.

If you have questions or comments about this column, please E-mail me at [jheller@sierra.net] and/or CompuServe [72130,1352]. I will gladly share what I know or find a resource for you. For now, 73, Jack KB7NO.

Current Web Addresses	
Source for:	**Web address (URL)**
HF serial modem plans + software	http://www.accessone.com/~tmayhan/index.htm
PCFlexnet communications free programs	http://d10td.afthd.th-darmstadt.de/~flexnet/index.html
Tom Sailer's info on PCFlexnet	http://www.ife.ee.ethz.ch/~sailer/pcf/
SV2AGW free Win95 programs	http://www.forthnet.gr/sv2agw/
BayCom – German site	http://www.baycom.de/
Pasokon SSTV programs & hardware	http://www.ultranet.com/~sstv/lite.html
Winpack shareware for Windows	http://www.duckles.demon.co.uk/ham/wp.htm
Baycom 1.5 and Manual.zip in English	http://www.cs.wvu.edu/~acm/gopher/Software/baycom/
Source for BayPac BP-2M	http://www.tigertronics.com/
Tucson Amateur Packet Radio—where packet started—new modes on the way	http://www.tapr.org
TNC to radio wiring help	http://prairie.lakes.com/~medcalf/ztx/wire/
ChromaPIX & W95SSTV	http://www.siliconpixels.com/
Timewave DSP & former AEA prod	http://www.timewave.com
VHF packet serial modem kit	http://www.ldgelectronics.com

***Table 1.** Current Web addresses. If you encounter a problem with a European address, the network is often at fault. Try again later.*

Easy Antenna Reference

Quick basics for a quick decision.

Keith Woodward VK2AT
19 Dolphin Ave.
Taree NSW 2430
Australia

If you're a beginner, or find yourself moving to a new QTH, a most important consideration is what antenna can be erected for the bands on which you intend to operate. The purpose of this article is not to give designs down to every last nut and bolt, but to discuss some basics and point you in the direction of an antenna that may meet your needs. And while these suggestions are mainly related to the HF bands, all the antennas here may also be used for VHF operation.

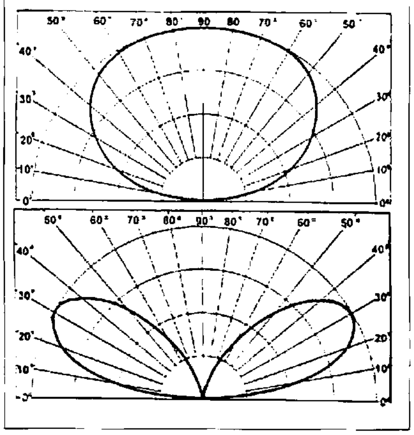

Fig. 1. Top: dipole 1/4 wave over ground. Bottom: 1/2 wave over ground.

The most basic antenna is the half-wave dipole. Most amateurs just run their half-wave dipole up the flag mast and see how it waves. The results that may be achieved with this simple antenna deserve some consideration. If you refer to **Fig. 1**, you will notice that the radiation pattern of the antenna will vary considerably with height. In the case of a quarter wavelength above ground, a large amount of your transmission will be confined to high-angle radiation. Increasing the height to one half-wavelength will lower the radiation angles considerably.

If you wish to confine yourself mainly to close contact, within, say, 1000 miles, then the lower height is of no concern. To extend this range then, if possible, elevate the antenna to around the half-wavelength mark. Reference to **Table 1** will show approximate heights above ground for the common HF bands. You can see why some tall trees, or artificial supports, will be handy for the lower frequency bands. Another consideration with antennas close to the ground, and other objects, is the loss from absorption or shielding. If this cannot be avoided, then go ahead and enjoy the results obtained.

I personally have enjoyed many QSOs using very low dipoles, necessary because of the restrictions of city and suburban allotments. However, long-distance contacts over 1000 miles were the exception rather than the rule on the lower frequency bands then being used. On occasion I have deliberately used very low dipoles on 3.5 and 7.0 MHz to obtain "local" coverage with excellent results.

With reasonable elevation, angles of radiation can be lowered by vertically stacking two dipoles. A simple method

HEIGHT	160	80	40	20	15	10
1/2 WAVE	83.3	41.7	21.1	10.6	7.1	5.3
1/4 WAVE	41.7	21.0	10.6	5.3	3.6	2.7

Table 1. Typical heights for horizontal dipoles. All figures are in meters and rounded off to one decimal place.

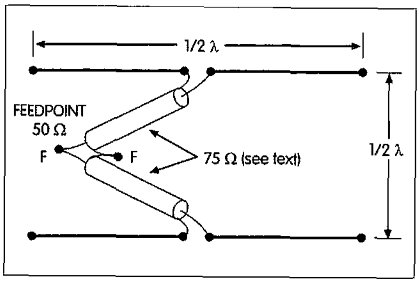

Fig. 2. Stacked dipoles. Approximately 2.5–3 dB gain, lowered angle of radiation, simple matching, broad horizontal figure-8 lobes.

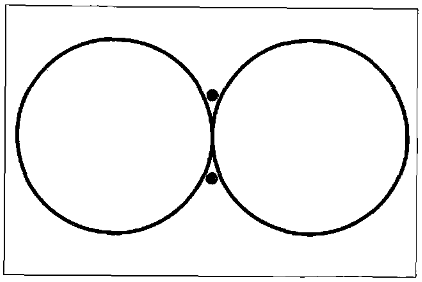

Fig. 4. Phased vertical dipoles. Spacing = 1/2 wavelength; phasing = 0 degrees; gain = approximately 2.5–3 dBd.

of doing this is shown in **Fig. 2**. Please note that when calculating the matching harness, the correct velocity factor must be taken into consideration. With a nominal velocity factor of 0.66, then two 5/4 wavelengths are required for the matching harness. With a higher velocity factor such as 0.80, it would be possible to use two 3/4-wavelength sections. The size of this array does limit it to the higher bands. The gain of 2.5–3.0 dBd plus the lowered angle of radiation make this a very useful antenna. It is simple to match and has a broad horizontal lobe extending in both directions broadside to the antenna.

In restricted space circumstances, due consideration must be given to the use of vertical antennas. Vertical antennas, usually quarter-wave or loaded quarter-wave, require a good ground plane for best results. In restricted space, it is usually easier to elevate the base of the antenna and use several wire ground planes cut for resonance on the bands in use. The main advantage of the vertical antenna, other than its omnidirectional coverage, is its low angle of radiation. This explains why a simple vertical, well-matched, can give results which sometimes outperform those from horizontal antennas. In **Fig. 3**, a vertical antenna is shown with its radiation pattern. This is the theoretical pattern when the center is one-quarter of a wavelength above perfect ground.

A similar pattern will be achieved when a good resonant ground plane is provided with an elevated vertical antenna. Many commercial vertical antennas are available and cover more than one band. While these antennas serve a purpose, do not expect the same radiation efficiency as with a single-band vertical. As with the horizontal dipole, it is possible to combine two vertical antennas to increase the radiated signal strength in selected directions.

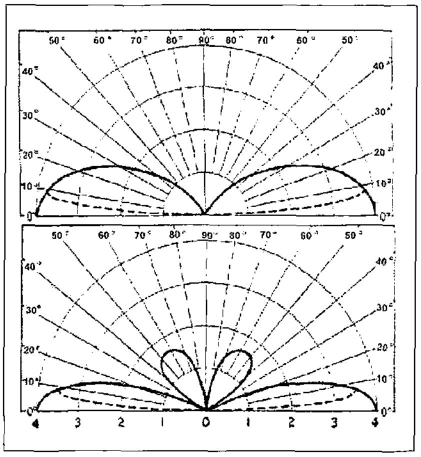

Fig. 3. Top: vertical dipole with center 1/4 wave above perfect ground. Bottom: the same, but center 1/2 wave above perfect ground.

Two ways, out of many, of combining two vertical antennas are illustrated in **Figs. 4** and **5**. In **Fig. 4** two vertical antennas, separately matched to 50 ohms, are spaced a half-wavelength apart at the operating frequency. The same stacking harness as suggested for the stacked horizontal dipoles is used. A figure-eight polar diagram is the result of this combination and achieves approximately 2.5 to 3.0 dB gain over a single vertical antenna.

In **Fig. 5** the two verticals are spaced one-quarter of a wavelength apart and connected together with a three-quarter-wavelength matching harness made of 50-ohm coaxial cable. This phasing of the antennas produces a cardioid unidirectional pattern, which gives a gain in the most favored direction of approximately 4 dB over the single vertical antenna. In accordance with the principle of not getting something for nothing, the radiation in the opposite direction is noticeably reduced.

Returning to horizontal antennas, there is a need to provide for more than one band of operation. The easiest method is to parallel two or more dipoles from the same feedpoint. I suggest, if possible, separating the dipoles by some distance. In one case I erected a five-band dipole, spacing the elements for each band approximately six inches apart with plastic spreaders. This operated quite successfully on 40, 30, 20, 15, and 10 meters. As with all dipoles, I made all the elements too long at the lower end of the band and pruned each band's elements until I achieved resonance at my favored frequency of operation.

It's time for an unpaid commercial announcement. Over the last nine

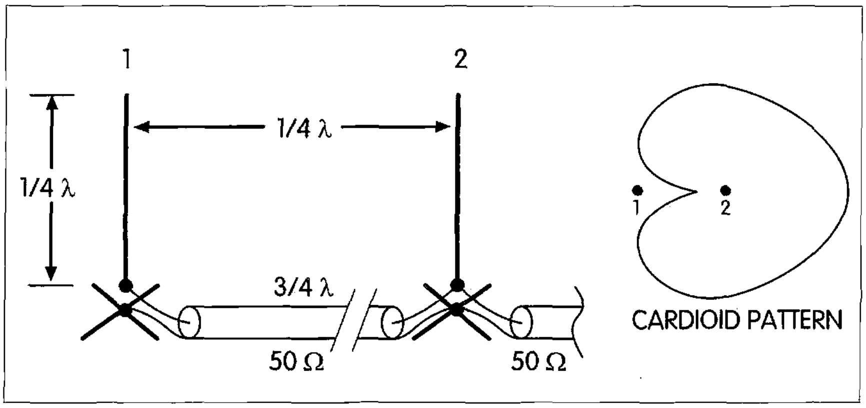

Fig. 5. Unidirectional phased ground planes; gain approximately 4 dBgp.

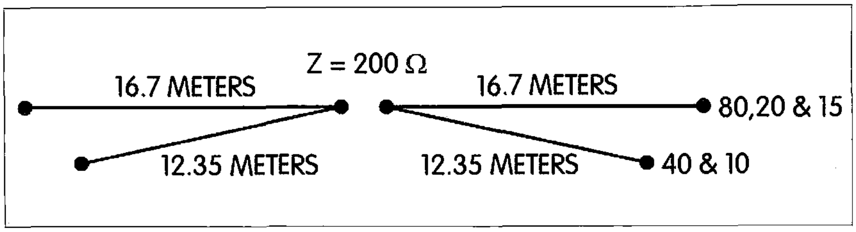

Fig. 6. Multiband antenna.

months, I have been in antenna heaven with my new MFJ-259 Antenna Analyzer. This has been a joy to use and has saved me untold hours during antenna construction and testing. Other methods of SWR testing may be used, but quite frankly my other test equipment is tending to gather dust.

Fig. 6 shows an antenna which quite a few of my amateur friends have tried with good results. While I have not tried this antenna myself, those whom I have worked on the air using the antenna have been quite happy with its performance. The elements are chosen not to be self-resonant on any band, but to exhibit a mean impedance of approximately 200 ohms at the feedpoint on 80, 40, 20, 15, and 10 meters. It may be fed with an open-wire, such as air-spaced 300-ohm line, a four-to-one balun, or two lengths of coaxial cable. The last method is claimed to reduce noise pickup by the feeder. The two lengths of coaxial cable should be exactly the same length—RG-58CU would be suitable for reasonably short runs. Ground the two braids at the shack and join the braids at the antenna end. The two inner conductors are joined to the antenna and to a 4:1 balun at the shack.

While theoretically the antenna should have an impedance of approximately 200 ohms on all five bands, you will probably need an antenna tuner to achieve a good match.

This does not exhaust the antenna possibilities for HF operation, but hopefully will be sufficient to help you examine your options for a quick start with a new antenna setup.

NEVER SAY DIE

continued from page 4

speakers are now almost 50 years old.

It's been a while since I told the story, but this all started when I was working at Airborne Instrument Laboratories on Long Island (NY) as an engineer. Well, I was putting in time while looking for a job as a television producer-director. I got started in that business as the chief cameraman at WPIX, Channel 11 in New York. Then I put KBTV in Dallas on the air as the director of their live shows. When that station went to all film to save money, I was out of work, so I went back into engineering.

One of my projects had an engineer, John Karlson, who'd invented and patented a wideband microwave antenna. Hmm, says I, microwaves and audio have the same wavelengths, so this ought to make a good speaker enclosure, too. When a TV directing job opened up at WXEL in Cleveland, I lent my audio test equipment to Karlson so he could get busy developing a completely new kind of speaker system. About a year later, I got really fed up with my directing job, which turned out to be strictly routine news and sports shows, and moved back to New York. There I found that Karlson had done nothing. So, with me pushing, we spent the summer using an open field as a laboratory and designed a speaker cabinet using his antenna principle. Its size was mainly determined by the size of my car door so we could cart it around. The sound it produced was awe-inspiring.

We took it to Avery Fisher (you've heard of Avery Fisher Hall at Lincoln Center?). He listened and offered to sell it with his Fisher audio equipment and give us a 4% royalty. Karlson wanted to go for that, but I saw this as an opportunity to build our own business.

Neither of us had any money, so I borrowed $1,000 from the bank on my car to get some sample units made at a local woodshop. We wrote an article for *Radio News* which brought in a bunch of prepaid orders, and we were in business. The hi-fi stores took one listen and ordered

Continued on page 57

The IC-706MKII Shack-in-a Box

continued from page 29

Parting comments

The new ICOM 706MKIIG model will include the 440 MHz band. This can be considered normal model progression. ICOM must compete with the new Yaesu FT-100, which includes 440. Anything else earthshakingly new about the G model? Not really. Am I going to run out and get a G model? Nope—I don't have a need for the additional coverage. But the G model is evidence of the continuing trend toward more power in smaller boxes.

There are two after-market items I wish were available to use with the 706MKII:

• A high/low cut audio filter—without the other DSP frills (therefore inexpensive).

• A keypad for direct frequency entry—à la Stone Mountain Engineering's QSYer (no longer produced).

If any of you are interested in designing/marketing such devices, remember: They could be applicable to not just the ICOM 706 series, but also the new Yaesu FT-100 and whatever else Kenwood is cooking up to compete with, too.

Here Comes the Sun

continued from page 36

thunderstorm many miles away. A number of these devices are in use as "UFO Detectors," and the portable devices might even be useful in investigating strange phenomena such as crop circles or poltergeist activity.

More information on these and other devices can be found on the Internet by going to my site at [http://www.bioelectrifier.com] and clicking on the SOLAR link. You can also reach me via E-mail at the address at top or by clicking on the "hot key" on my Web site.

Tracking Dual-Voltage Power Supply

Build something handy while you wait for the year's first hamfest!

Hugh Wells W6WTU
1411 18th Street
Manhattan Beach CA 90266-4025

Upon more than one occasion a ham experimenter will find a need for a utility power supply that will provide a variable voltage as well as equal values of both positive and negative voltage to power a project. Such an occasion occurs, for example, when you are experimenting with op amps, which usually require ±15 volts. But even when a dual voltage is not required, it is nice to have a variable voltage supply available.

The power supply shown in **Fig. 1** provides a regulated variable voltage output which is adjustable from 2 to 16 V per side and 4 to 32 V between the outer voltage rails. Being a utility supply, it is not intended to be a real powerhouse, but the design concept could be used to develop one. In the configuration shown, the 2 to 16 V output on one or the other side is capable of providing a maximum current of 300 mA intermittently, but should be limited to about 100 mA to keep the transistors' heating to a minimum.

Even with the high load differential between sides, the voltage between sides will remain within about 10 mV. When the load is either divided between the two sides, or the total load is taken from the outer voltage rails, about 450 mA is available. The governing factors involved in the amount of current available are the power transformer, regulator, and transistors Q1 and Q2. However, transistors Q1 and Q2 govern the output current only when there is a current differential between the two sides.

The principle of operation is based upon floating a common reference point between the two outer voltage rails and shifting it to maintain an equal value between each side. To accomplish that, as shown in **Fig. 1**, complementary transistors Q1 and Q2 are "pass" transistors, each carrying the return path current for individual loads tied between the rails and the common point. An LM741 op amp is used to "sense" the voltage differential and shift the common reference point by driving the bases of Q1 and Q2 as needed to maintain equal (+) and (-) values. Most any typical NPN and PNP TO-220 transistors will work in this application.

Heatsinking for Q1 and Q2 is not necessary unless the power supply will be intentionally operated with a high differential current between sides. Placing a one- or two-inch-square aluminum plate on each transistor tab will provide adequate emergency heat protection for the transistors as they are normally cool, because they handle only the differential current.

I recommend that a heat sink be used on the voltage regulator because it handles the total load current. In the prototype project, a pressed sheet metal heat sink (Thermalloy #6025) was used, with the legs soldered into the board for mechanical support.

A voltage balance between the two sides is created by connecting the pot R4 between the two voltage rails and using it to locate the center value. A miniature 10–15 turn pot was selected for the application to achieve a fine adjustment setting; however, a single turn pot will work OK. The actual value of the pot is not critical, but a value between 25 k and 50 k is preferred. Should it be necessary to use a 10 k, as indicated in the parts list, two 10 k fixed resistors should be added to the circuit by placing them in series with one on each side of the 10 k pot. The objective of the added resistance is to reduce the amount of current flowing through the pot.

The balance is adjusted typically at full voltage output by alternately measuring the voltage between the common

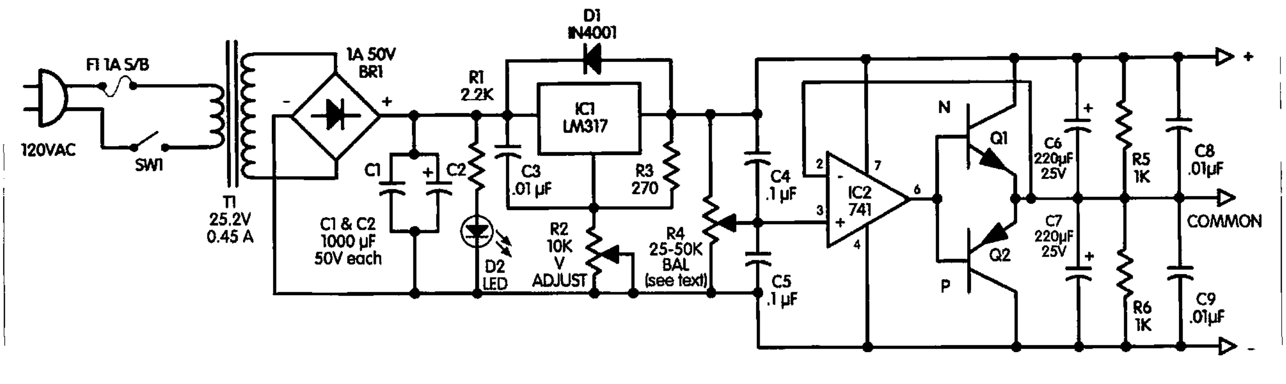

Fig. 1. Schematic of the tracking dual-voltage power supply. Positive and negative outputs track within 10 mV.

reference point and each rail while the pot is adjusted to create equal voltage values. An output load on the power supply is not required during the balance adjustment. Following the adjustment, a load may be used to verify that the circuit will maintain a balance while under a load. The 0.1 µF capacitors connected across the balance pot help reduce the noise voltage that might enter the input of the op amp. Any noise voltage, or hum, appearing at the balance pot input to the op amp will appear in the output voltage.

Power supply regulation is accomplished by utilizing one variable voltage regulator, and in this project, an LM317T was selected. The advantage of using the op amp and the complementary transistors is that only one voltage regulator is required. In the absence of the op amp, two regulators would be required, one for each rail, and getting them to track over a wide voltage range would become a real technical issue. The regulator establishes the maximum available total terminal voltage which is then divided between the two sides. As the regulated voltage is reduced, the voltage on each side will also reduce, but they will remain equal in value.

Here is a technical point that must be considered separately, although it must be considered for other supplies as well. In this case, there is a high in-rush current when the power switch is closed. As a result, the fuse selected must be able to handle that current. The actual fuse current value is typically much larger than the operating current. The high in-rush current is caused by the two 1000 µF filter capacitors connected directly across the output of the bridge rectifier. Upon turn-on, the capacitors exhibit essentially a short across the transformer's secondary. The capacitor charge current decreases after turn-on, allowing the in-rush current to subside. Where a 0.5 A fuse would be typical for the transformer used in this project, the in-rush current dictates that a 1 to 1-1/2 A S/B fuse be used.

Construction

Parts for the project are readily available from many sources (Hosfelt, Mouser, Radio Shack, etc.).

Construction of the Tracking Dual-Voltage Power Supply is straightforward, with no special mounting or critical wiring requirements. Parts may be mounted using any desired method. Perhaps the only critical item in the construction of the power supply is a vertically mounted heat sink for the voltage regulator, as it must be used (or the regulator could be mounted against the chassis and insulated from it) to achieve adequate cooling. If the regulator is remotely mounted, capacitor C3 must be placed right at the regulator terminal and not on the circuit board. The purpose of capacitor C3 is to reduce the gain-bandwidth of the regulator to prevent it from oscillating.

As an aside, capacitors C6 and C7 were selected to be axial lead for convenience and availability. However, you may choose to use radial mount capacitors. Any reasonable front-panel layout can be used. The panel will support the voltage adjust pot, binding posts, LED, and power switch. Calibration marks are placed on the front panel using a marking pen, with the marks placed around the adjustment knob. The positioning of the marks is determined using a digital voltmeter as a reference for each value to be marked on the panel. Although the marked voltage values won't be totally accurate, they provide a suitable reference for ballpark voltage adjustments.

Capacitors C8 and C9 are mounted behind the panel and directly on the terminals. Their objective is to reduce the output terminal impedance to an RF environment should the power supply be used around an RF circuit.

Wiring between the front panel and the board is divided between the AC power line and the rest of the wires carrying DC. The wires from the power switch are twisted and lie along one edge of the circuit board, traveling back from the front panel toward the rear panel. All remaining wires carrying DC are routed across the back side of the panel and along the opposite edge of the board. It is important to separate the AC power from the DC circuit in order to reduce the

Continued on page 57

Tracking Dual-Voltage Power Supply

continued from page 56

Parts List

C1, C2	1000 µF radial cap (272-1032)
C4, C5	0.1 µF 50 V disc ceramic cap
C3, C8, C9	0.01 µF 50 V disc ceramic cap
C6, C7	220 µF 35 V axial lead cap (272-1017)
R1	2.2 k 1/2 W resistor (271-1121)
R2	10 k pot, linear (271-1715)
R3	270 Ω 1/2 W resistor (271-1112)
R4	10 k–50 k pot (271-343 = 10 k)
R5, R6	1 k 1/2 W resistor (271-1118)
IC1	LM317T adj volt regulator (276-1778)
IC2	LM741 op amp (276-007)
Q1	TIP29 NPN TO-220 trans (RSU11371168) or TIP31 NPN TO-220 trans (276-2017)
Q2	TIP32 PNP TO-220 trans (RSU11371218) or (276-2027)
D1	1N4001 diode (276-1101)
D2	Red LED (276-041)
BR1	1 A 50 V bridge rect (276-1152) or (276-1146)
T1	25.2 V 450 mA pwr trans (273-1366)
F1	1-1/2 A S/B fuse (270-1022)
S1	Toggle switch

Miscellaneous Parts

Fuse holder, panel mt (270-364)
3 5-way binding posts (274-662)
1" diam pointer knob (274-416)
Cabinet (270-253)
Power cord (278-1255)
Cord grommet
8-pin IC socket
3 1/4" standoffs
Heat sink (see text)
Circuit board (as required)

Table 1. Parts list. Part numbers listed are from Radio Shack.

introduction of hum into the regulator and op amp circuits.

Conclusion

There is always a need for another power supply when you are working on a project. The advantage of the Tracking Dual-Voltage Power Supply is that it functions both as a utility supply and as one that will provide simultaneous positive and negative voltages which track within a few millivolts. The dual voltages are suitable when experimenting with op amps and other circuits where a split voltage source is needed.

Construction of the power supply is simple and utilizes readily available parts from many sources. Build it, and you'll always have a suitable utility power supply available!

NEVER SAY DIE

continued from page 54

units. They were made out of 3/4-inch plywood and built like bricks, with most units covered in either blond or mahogany Formica®. We also had plain plywood units and kits.

Karlson, who was an engineer at heart, kept working for Airborne while I went to work marketing the enclosure. That meant building a national rep organization, demonstrating it at hi-fi shows all around the country, and trying to keep up with the demand. All audiophiles had to do was hear the unit and they had their wallets out. Before long it was the best-selling speaker cabinet in the country, with seven wood factories turning them out for me. I had the kits all made in La Jolla (CA), with most of them being shipped via the Panama Canal to my east coast warehouse in Brooklyn. I had an office in Altadena, run by the chap who'd hired me to work on a Guggenheim Grant project a few years earlier. Soon our sales were well over a million dollars a year, which is more like $20 million in 1999 dollars. I did the usual Porsche, airplane, yacht, and Arabian horse stuff. You know the routine.

But all through this I'd been having a ball with ham Teletype. I'd started my *Amateur Radio Frontiers* journal while at the TV station in Cleveland and was putting it out offset-printed every month, doing my best to get more hams interested in the fun I was having with RTTY. That led to an RTTY column in *CQ*.

Then, when I got *CQ*'s editor a better job (as the editor of *Popular Electronics*), I got offered the editor's job at *CQ*. I figured that would be more fun than loudspeakers, so I turned Karlson Associates over to Karlson to run. We'd been 50/50 partners and the company was growing like crazy, so what could go wrong?

Karlson ran the company his way and ignored any advice from me, so it was dead in less than a year. Pfft, and my 50% was worth zilch. Well, money never was important to me, so what the heck. I was having a ball at *CQ*, talking at hamfests, going on DXpeditions, and so on. But that's another story.

My pitch right now is that no one is making the Karlson Enclosure today and this presents a wide open opportunity for an entrepreneur. It doesn't take a lot to get started, as I proved. And, if they work with me, I know some ways to make the cabinet sound even better. Well, I've learned a lot more about acoustical design since building my own recording studio. A few small changes in the cabinet design should make it a killer.

But then you're too busy commuting to work and worrying about being downsized to get involved with starting your own company, right?

IMAX Lays An Egg

Most of the IMAX Theater films I've seen have been outstanding, so their latest releases surprised me. For my birthday, we went to Boston to the IMAX Theater in the Museum of Science, where we saw *Titanic* and *Everest*. *Titanic* was a bomb. What a waste of time. *Boooo*. *Everest* was a little better, but not a lot. Okay, it's a bitch to climb and people keep getting killed trying.

The TV ads for their newest release, *Amazon*, looked more promising, so we drove down to Boston again. This was even worse than *Titanic!* The camera work was bad, with closeups of animals that spread them across the huge screen. Endless pictures of old boats on the river. Some natives doing a tribal dance that they obviously had never rehearsed. But I learned nothing much about the natives, the destruction of the rain forest, and so on. It was a bore.

At the start of every show, they demonstrate their 70,000-watt sound system. As an audio expert I can tell you that it sounds crappy. They've tried to make up for the mismatch of loudspeaker cones to the air of the theater by using dozens of them. That doesn't cut it. You have to

Continued on page 58

Never Say Die

continued from page 57

have an air-matching transformer to do the job.

The IMAX theaters could enormously improve their sound if they would get rid of that junk they have and put their speakers in Karlson-type enclosures — like the ones I used to make.

Mine were so outstanding that many hi-fi stores used a wall of them to demonstrate the speakers they were selling — since they made every loudspeaker sound fantastic.

Cruelty

While at the Peoria SuperFest I met a lot of hams who were obviously alive and thinking. But I also saw hundreds of hams wandering around with no one seemingly at home upstairs ... the walking, working stiffs who are slowly poisoning themselves and their families, and who never will either make much money or leave anything significant behind to mark this particular visit to Earth.

No, it isn't their fault. They're the victims of our public schools, like their parents before them. It's an experience that few survive with any creativity or motivation. Even if I went up to these walking dead and shook them hard I don't think I'd be able to wake them up.

How bad are our public schools? Hey, if you don't believe what I've been writing, at least read what John Taylor Gatto has been saying. He's the prize-winning New York teacher who quit after 26 years as a teacher — because he just couldn't do that to kids any longer. The American public school system is a crime. It's cruel and unusual punishment for your children, and should only be used if you truly hate your kids and want to make sure they will never think or amount to much. It's also the most expensive school system in the world, by a wide margin.

Our school buildings are awful. Our teachers are, for the most part, dreadful. The school books are beyond description in bad. And then there are the administrators. In New York, about 80% of the school budget goes for administration. In New Hampshire, we're doing better — it's only 50%.

I'm exaggerating? For heaven's sake, read some of the books I review in my *Secret Guide to Wisdom*. Read some of Thomas Sowell's books. Please! Read Rita Kramer's appalling report on the 13 teachers' colleges she visited. Read the eight books I recommend about the Sudbury Valley School. Read about the Montessori schools. Please turn off the TV just for a little while and find out what you've let happen to our kids. How much of your life is either work or entertainment? How much time do you spend improving your education? My wisdom guide at least makes it so you can get a maximum of information with a minimum of effort. I've done the hard work in finding these book gems, now you do the easy part.

And don't forget to read Gatto's *Dumbing Us Down*.

It comes down to this: If you send your kids to a public school, you don't deserve to have kids. And don't whine about how were you to know? I've been writing about this for years, and so have Gatto, Sowell, and a bunch of others. It's your fault if you are ignorant, but it's your kids who will have to pay the price.

Life After Death?

In my dictionary, definition #4 of "life" includes spiritual life after death. It also includes, as #7 under "death," the death of the spirit. Thus, while life as we understand it ends with death, there is more than enough reliable information about the spirit world to convince all but the most unread or pathologically skeptical that life as we understand it does not totally end with death ... that the spirit, soul, or whatever, endures.

Our English language, as marvelous and extensive as it is, just doesn't provide us with the words we need to communicate when our thoughts get away from the concepts of life, science, matter and time.

In my *Guide to Wisdom*, I recommend Michael Crichton's *Travels*, in which he describes his experience in spoon bending and with auras. I recommend Scott Adams' *Dilbert Future* for the last chapter on the power of the mind. Then there's Allan Boone's *Kinship of All Life*, which explains how you can communicate with almost any living thing. I cite Dean Radin's *The Conscious Universe*, where he shows that scientific research has proven beyond the doubt of the most cement-minded skeptic that our minds *can* influence matter, that we *can* predict the future, and that we *can* communicate mind-to-mind.

But the best book I've ever found which provides an insight into what we think of as the "next world" is May Sewall's *Neither Dead Nor Sleeping*. You need to read this book. Your friends need to read it. Anyone you know who has had a recent family death absolutely should read it. Fortunately, Dr. Lydia Bronte, the author of *The Mercury in Your Mouth*, has just reprinted this 1920-published book for us. You can get copies from Quicksilver Press, 10 East 87th St., New York 10128. It's only $15, plus $3 s/h per order, which is very reasonable.

Revolting

What can you do about some nut-farm escapee who insists on making your hobby a nightmare? One solution, I've proposed before ... but, knowing how short older memories can get, particularly with those who've been using aluminum antiperspirants, or drinking beer or soft drinks from aluminum cans, I'll repeat it. This consists of making recordings of the more offensive garbage the perp has been transmitting and sending cassette copies to his neighbors, along with an explanatory note.

How do you get his neighbor's addresses? Simple: Just find someone with a phone ROM and look at the addresses near his. For instance, one of the ops said to be a long-time jammer of 7240 kHz is KK6BS. I looked his address up on my ROM, which was 9255 N. Magnolia Avenue, Space 2, San Diego. I then looked at that address and found the names of ten other families living in that same mobile park. Another reported repeated offender on 7240 is N2ENY in Buffalo. I had no problem finding the names and addresses of his neighbors.

Another approach, which I find inexcusably reprehensible, is the sending of letters to neighbors of the really serious offenders, using a letterhead such as the Pedophile Neighborhood Alerting Group (P-NAG) and asking if they have been alerted by their local police of the moving into the neighborhood of a repeated pedophile offender at such and such an address. They're not saying anyone at that address *is* a pedophile; they're just asking if the police have notified them.

I'm sure there are less nasty ways to deal with nut-farm escapee hams who are infecting our hobby. It just takes a fiendishly creative mind. What has your group found to work in a situation where some old crank is spewing filth on our bands? No, the ARRL or the FCC isn't going to help — we are supposed to be a self-regulating hobby, remember? So get busy and self-regulate.

Years back, when I was living in Brooklyn, we had a Spanish-speaking Brooklyn ham who refused to talk with locals, and was abusive about it, saying what he thought of gringos. He would only talk with Spanish-speaking stations. A few members of a local club got together one evening and visited him to explain about being more neighborly. After his broken arm healed, he couldn't have been nicer to the locals on the band. Well, no one has ever

Continued on page 59

continued from page 58

accused Brooklyn hams of being subtle.

Bribery

If you are a smoker, please skip this — you aren't going to like it.

With what we know about the destructiveness of smoking, anyone who continues to smoke must either be incredibly ignorant, a weak-willed spineless wimp, and/or a really stupid person. I'm afraid that I have little respect for smokers.

Thus I'm offended by the increasing number of movies that have their characters lighting up. This is not something an intelligent person does anymore, so when I see it in a movie, my first assumption is that the writers are signaling me that this is a villain. Smoking is like wearing a black hat in a western. But when I see nonvillains lighting up, I know that the cigarette companies must have paid a bunch of people off. There's no other logical explanation.

It's been brought out in hearings and court cases that the cigarette companies have known for decades that their product is a killer, and that they'd gone to a lot of trouble and expense to keep this information from the public, so there's an excuse for the writers and actors in the old movies to smoke. But today, nothing but payola can explain it.

One of my grandfathers died of pneumonia when he was in his 50s. He smoked pipes, cigars, and cigarettes, and they killed him while he was still relatively young. My dad smoked Camels. When, in his 60s, he began fainting, the doctors told him to stop smoking or he could die at any time. But it was too late — he lived on for a few years with emphysema and heart trouble, having to have an oxygen tank or generator with him 24 hours a day.

The cigarette companies are spending whatever it takes to try to make smoking attractive to kids. I see kids hanging around in the shopping malls smoking. I see the local high school kids walking by the door of my company in Peterborough smoking.

Back in 1965, I was distributing matches at hamfests which read on the cover that they were cancer-free matches. I got the local match company to make them so they couldn't be lighted.

When Siskel and Ebert recommend a lousy movie, I suspect that some money has changed hands. When I see gratuitous smoking in the movies and on TV, I know the cigarette companies are still at it.

How to Kill Your Dog

You can slowly and painfully kill your dog the way millions of other good-intentioned pet owners do — by feeding the poor defenseless creature commercial dog food. I'm talking canned food and those bags of pellets.

Unlike humans, who have been eating cooked food for several thousand years, dogs have been eating raw meat until just fairly recently. Their digestive systems aren't able to cope with cooked meat, nor with the filler the commercial dog food companies use to keep their costs down.

What can you do about it? That's simple: Make friends with a local butcher and ask him to save his meat scraps for you instead of throwing them out.

Dr. Bruno Comby, over in Paris, noticed that in one report after another, dogs and cats fed cooked food lived shorter lives and came down with human-type ailments, including cancer. But, when changed to raw meat, they quickly got well again.

Hmmm, thought Bruno, if that works magic for animals, how about humans? So he tried putting some of his sicker patients on all-raw-food diets and they miraculously were cured, even when in the last stages of cancer. Dr. Lorraine Day confirmed this when she cured her own cancer the same way.

Now, I'm convinced you don't give a damn whether you and your family get cancer, or have heart attacks or strokes or not, but at least have some compassion for your dog.

Brainwashing

You. I. All of us have been through a lifelong brainwashing experience, and part of the brainwashing is that we have accepted the whole idea that brainwashing is good. Yeah, I'm talking about our acceptance of universal incarceration for a minimum of twelve years in a government institution known as public school. Not that most private schools are much better.

Where did the idea come from that a composer, a writer, a plumber, and a military tactician all should have the exact same education? I'll tell you where if you promise not to get mad. But that acceptance has resulted in our no longer having brilliant composers, writers, plumbers, or military tacticians. Or, alas, brilliant anything else. They did it to you, you're doing or have done it to your children, and so on.

What's happened in music is typical of what's happened in all of the arts. And what's happened in science, inventing, politics, and every other aspect of our civilization. We've managed to almost totally stunt initiative, motivation, determination, perseverance, and creativity.

I keep trying to wave readers into my tent, where I ask them (you) to think. I'm brushed off as crazy, controversial, and a troublemaker. But I feel like I'm trying to plant the seeds of wisdom in a desert. The ground has been made sterile. There are no minerals left in the mental soil, only ball games, sitcoms, and Jerry Springer as artificial fertilizer. The equivalent of using totally dead chemical fertilizers on our croplands instead of crushed live rock.

We're kept in line by our addictions being fed. Keeping us thoughtless and busy. We're addicted to drugs like alcohol, caffeine, nicotine, sugar, fat, aspirin, rock 'n' roll, TV, talk radio, ball games, sex scandals, a media obsessed with reporting bad news in depth and endlessly, and so on. Hey, "it sells papers."

When I see a kid wearing big loose pants and a baseball cap on backwards, I know I'm looking at a totally brainwashed youngster who hasn't a shred of originality left in his head. He's probably smoking, too. And cruising with his friends, throwing beer cans out of the car or pickup as they finish chugalugging them.

This drive to turn us into as nearly identical cogs in the wheel as possible is also a driving force in the medical industry as well as with psychiatrists. Each tries to fit us into a diagnosis pattern they're familiar with.

But, despite every effort to make us identical, even starting with birth where we are separated from our mothers and put into a nursery, the system has failed. We *are* all different. Our genes are different. We look different. Our voices are different. Our fingerprints are different. We're allergic to different things in different intensities. The first few years of our lives expose us to a much less structured foundation for the development of our lives, though the growing use of daycare centers is gradually closing this leak in the drive to make us identical. Like the interchangeable parts for our machines.

One Size Fits All

We put all of our kids into the school hopper. Never mind that their IQs range from genius potential to troglodyte, that some kids have been given every opportunity to develop their brains and bodies during their first six years by enlightened parents, and others have been imprisoned in playpens. That some have been allowed to learn to speak fluently and accentlessly in several languages, and others have only a vague grasp of one. That some have been fed healthy diets and others have been brought up eating Froot Loops and Count

Continued on page 60

NEVER SAY DIE

continued from page 59

Chocula crapola. Well, you get the picture.

Yes, there *are* a few schools that are breaking the mold, where kids learn what they want when they want, without the stress of tests and grades taking away the fun and excitement of learning. Kids, when allowed, love to learn. I remember when I had a software development laboratory with over thirty computer systems set up and we allowed any interested local school kids to come in after hours and have fun. My programmers said that these kids were like industrial vacuum cleaners when it came to asking questions and teaching themselves how to program. Some brought their sleeping bags so they could keep at it until they dropped.

CPR

Sherry and I took a CPR course at a nearby Red Cross facility. Well, heck, you never know. I'm doing my best to rebuild my body with a raw food diet after the 75 years of destruction I've done to it through not knowing any better. You know, with coffee and doughnuts after ham club meetings and at the Dayton HamVention (they're free in the exhibitors' lounge), pizza, pasta, French fries, and so on. It's a wonder I've survived this long!

Anyway, my cousin Sanger and his wife Carol stopped by to visit a few weeks ago, and Sherry was telling them about the CPR course. Carol rolled her eyes, saying that she'd never do CPR. Ugh! Sanger said, "But what about me?" Carol ignored him.

Carol called a couple nights ago to say that Sanger, who was 70, had suddenly slumped over with a heart attack. She'd called 911, but by the time the emergency team got there, it was too late. I don't think she remembered her disgust over learning CPR, but if she'd known how to do it, it's likely that Sanger would be alive today.

If you care for your mate, take a couple evenings and take a CPR course — it could mean the difference between life and death. When a heart attack hits, you have only a few minutes to get oxygen into the person or it's too late. After the heart attack happens is one heck of a time to try to learn CPR.

Of course, if you change your and your family's diet, there aren't going to be any heart attacks, but I'm pretty well convinced that you'd rather die 50 years sooner than necessary than change to a healthier diet. Well, at least a heart attack can lead to a fast and painless exit from life as compared to most of the other routes our diet is taking us.

Raw Food?

Well, bananas, apples, oranges and grapes are easy when you're considering a raw food diet, but what about stuff like potatoes, turnip, and so on? Raw potato doesn't sound all that great. Ugh.

One of my first tries was chopping up cauliflower, carrots, and broccoli in the Cuisinart and eating the mixture with some of my grandmother's cole slaw sauce on it. That was a winner.

Salads are easy. I cut up some spinach, watercress, beet greens, bean sprouts, alfalfa sprouts, some pine nuts, little chunks of Kraft's Baby Swiss cheese, and golden raisins, again with some cole slaw sauce for dressing. I generally have a large bowl of salad with both my lunch and dinner meals.

But what about the other vegetables? I got to thinking how good a New England boiled dinner is, with boiled potatoes, cabbage, beets, turnip, and carrots. Then the next night you chop the leftover veggies into red flannel hash, warm it up, and pop a soft-boiled egg on it. Now that's good stuff.

Well, maybe you don't have to boil the veggies, I thought. So I put a potato, skin and all, a beet, also with its skin, a couple of carrots (with skins on), and a quarter of a cabbage into my Cuisinart and chopped it all up together. Like everything else, with some cole slaw sauce on it, it's great! And that's raw everything, not boiled.

Chopped cabbage with the sauce on it *is* cole slaw, so that's good, too. I'm finding more and more things that are good raw. How about you experimenting and letting me know what you find?

If you've lost my cole slaw sauce recipe it's simple: two parts of extra virgin olive oil, two parts of apple cider vinegar, one part of honey, five parts of plain yogurt, some salt, pepper, and a handful of celery seeds. Whip it all up together. It'll keep for a week or so in the fridge. It may keep longer, but my supply runs out in about 10 days so I don't know if it will spoil or not.

Dr. Campbell *(Second Opinion)* recommends eating three apples a day, one before each meal. Hey, if one will keep the doctor away, just think what three can do! They also tend to cut down your appetite, so you don't eat as much during the meal.

I'm still eating a little cooked food, but I've always preferred my meat almost raw, so these days I just barely singe it. I like it a lot better that way. Have you ever tried liver cooked about 15 seconds a side? More and more people are discovering how good raw meat is. The rest are so revolted by the idea, they'll never taste it and will help keep our Social Security problem minor.

Piercing the Veil

How *could* the German people have gone along with Hitler in his killing of six million Jews, plus another three million of other undesirables that we don't hear about as much? Or the Chinese with the millions Mao killed, and the Russians with the millions Stalin wiped out?

For that matter, what could have been wrong with the Heaven's Gate group? The Jones followers? The Koresh (Waco) people? And so on. Did their leaders manage to find people different from the rest of "us"? There's nothing to be smug about — there, but for accidents of chance, go you and I. It's worse than that.

The same aspect of our human minds is at work with the religious fanatics in the Middle East, in India, Japan, and everywhere else around the world. Including fanatics here in America. That's right, the same human-mind propensity to believe in things without proof that's making life miserable for people in Afghanistan, Syria, Lebanon, Pakistan, Iraq, Iran, and Turkey is alive and well here in America.

We use the term "brainwashing," but it's the opposite of that. It's mass hypnosis. It's brain polluting, not washing, and we're all victims of it every day in every way. We are "brainwashed" to believe that ball games are important, that Monica Lewinsky is important. Our TV, newspapers, magazines, radio, the Internet, and all media are busy trying to influence what we buy, what and where we eat, what we do, where we go, what church we attend, and so on. It's an efficient system and we've all been suckered into it.

We're used to being fooled by special effects from Hollywood, so we're not too surprised when we find out that many of the shots which looked so real of the *Titanic* fooled us. But any time we think the Germans who were convinced by Hitler to help kill nine million people were different from us, we're fooling ourselves.

So here's Wayne Green, lifting the flap of the tent, saying hey, take a look over here behind the scenery. See how we've been fooled into our belief in our school system, our health care system, our jobs, the (ha, ha) war on poverty and war on drugs, and (you're going to really hate this) our religious convictions.

The sorry fact is that we're all prisoners like the Heaven's

Gate, Jonestown, and Koresh people. We don't want to look behind the stage scenery at the real world. "All the world's a stage," was more on target than even Shakespeare knew.

Follow Through

Our government seems to have its ability to waste money developed to a high art, and particularly when it comes to the so-called education field. Congress, whipped into this insanity by one of the most powerful unions in the country, the NEA, has been blowing billions of your dollars and mine. The NEA seems to have as its main goal protecting the jobs of incompetent teachers and the building of administrative empires.

Anyway, you've heard about Project Head Start, a well-intentioned effort to give kids from extra-lousy backgrounds a way to at least keep up with kids who have more caring parents. Billions of our money have been poured into this beaut — and it's still happening, despite endless surveys showing that the positive results of the program have not provided any long-term benefits.

Well, heck, if Head Start doesn't provide long-term benefits, then let's throw a few billion more into the program with Project Follow Through and see if that does the job. A number of different teaching approaches were tested to see which might be best. Some provided short-term improvements, some ways turned out to be quite negative by comparison with control groups of students. Did the negative results slow down the flow of money into the negative systems? Of course not. Did the lack of any significant positive long-range benefits stem the funding for the project? Not in our world it didn't.

While our kids have not benefited from the Head Start or Follow Through programs, Congress is continuing to fund them, with only the NEA members who are being paid to do this nonproductive work getting any benefit.

The NEA, via its hundreds of well-heeled lobbyists, keeps pushing state and federal legislators to pour more money into our school system, which they do, despite the need to continually lower our standards. There's been a lot of NEA pressure to have smaller classes, yet there are no studies showing that smaller classes actually result in better educations. Well, it sounds reasonable, so never mind all those studies showing that smaller classes just mean the hiring of even more poor-quality teachers.

What is it going to take to get you fed up with you and your children being fleeced?

Someone should start a parents' union and lodge a $10 trillion class action suit against the NEA for the damage they've done to our kids, our families, and our country.

Even More Y2K

After reading more books on the subject, plus listening to more experts on the Art Bell show, I can't help wondering what might happen to our country — to our whole civilization — if what these experts are predicting actually happens.

What if the power goes off all around the country? Not for hours — not even for days, but perhaps for weeks? This would mean no lights, no heat, no food, no water, in many cities no sewers, no police, no gasoline, no natural gas, and so on. A few hundred thousand people might be able to escape from the cities, but to where?

How many families in New York City, for example, would have emergency water set aside to last for a month? Food for a month? Food that doesn't have to be cooked or even warmed? Warm clothing to be able to live through January and February without heat?

Just how serious the Y2K problem is going to be won't be known until after it's over. But a prudent person might want to plan not to take any unnecessary chances.

Will the banks survive okay? Probably, but I sure wouldn't want to bet everything I have on them, so I'll be keeping a minimum balance. The stock market could be hit very hard, so a prudent person might get out of the market early, just in case. Or you might sell some of the more sensitive stocks short, hoping that the market will be able to survive. What would happen to the stock exchanges if all our cities closed down for weeks or even months?

How would our civilization function if a third or more of the people in our cities don't survive? There could be lawlessness on the order of what happened recently in Rwanda and not too long ago in Cambodia. What would America be like if 50 million people died in a few weeks? There wouldn't even be any way to bury the dead.

One approach is to pooh-pooh the whole thing. Hey, nothing like that could happen. At the worst, Y2K will just be a little bump in the road. But I do wish that I could read an encouraging report on the situation by anyone who has done a significant amount of research into it. It seems as if the experts are seriously worried and only the ignorant are unconcerned.

Y2K Strikes!

Many years ago, not realizing that, unlike all but a very few magazines, *73* would be around for decades, I sold lifetime subscriptions. Cheap. It started at a Miami hamfest, where a doctor pushed me for a lifetime subscription price. With a cover price of 37¢ (two for 73¢) and $3 for a year, $7 for a three-year subscription, I sold the first lifetime subscriptions for $37, one of the best bargains in the history of ham radio.

Well, who knew? I started the magazine in October 1960 with just barely enough money to print and mail the first issue, so the future was anything but certain. My publishing office was a little one over a grocery store in the low-rent outskirts of Brooklyn. A little over a year later, I packed everything up, including my ham shack, and moved to New Hampshire, one of my better decisions.

When I was personally maintaining the subscription records, which I did for the first couple of years, I marked the life subscribers as "LIFE." At that time subscriptions were cut into little paper stencils, and I printed the addresses on paper wrappers for the subscription copies.

Then the computer age hit and I invested in an IBM system using punched cards. My "itty-bitty-machine" demanded a number for expiration. Well, this was 1965, so I put the problem off into the far distant future by using 00. This was fine until I moved the operation to a subscription fulfillment company and they decided to use 99 for lifers — since their system read 00 as 1900. A couple years ago, we warned them that they'd better get the lifetime subscriber situation straightened out. And we kept warning them. Not knowing what to do about the problem, they ignored it. Big surprise.

Sure enough, come the time for renewal notices for subscribers whose subscriptions ended in January 1999, out went renewal letters to the lifetime subscribers.

The bright side for me was that this was an easy way to find out how many lifetime subscribers are still actually alive. I suspect that at least 90% have been ignoring my nagging about poisons and getting the right nutrition, so they may well have offed themselves many years before their bodies would have worn out if they'd given them much consideration. So, I'll see how many polite reminders or angry accusations of being a crook I get.

Yes, of course we should have checked the lifetime subscriber list every now and then to make sure that the subscribers weren't frustratedly trying from the "next world" to make contacts with their silent keys.

More Y2K Data

Enough already with the Y2K scare baloney, right? It's

Number 62 on your Feedback card

PROPAGATION

Jim Gray W1XU/7
210 E Chateau Circle
Payson AZ 85541
[jimpeg@netzone.com]

February 1999						
SUN	MON	TUE	WED	THU	FRI	SAT
	1 VP	2 VP-P	3 P	4 P-F	5 F	6 F-G
7 G	8 G	9 G	10 G	11 G	12 G	13 G-F
14 F-P	15 P	16 P	17 P-D	18 P-VP	19 VP	20 VP-P
21 P	22 P	23 P	24 P	25 P-F	26 F-P	27 P-F
28 F						

A glance at the calendar will tell you that February is not expected to be a good month for HF radio propagation. (Note: We have added "D," for disturbed, this month.) Your best days for success will be during the second week of the month, when the geomagnetic field and ionosphere are expected to be quiet. Unfortunately, they are expected to be disturbed and at minor to major storm levels during the first few days and the last *two full weeks* of this month.

During those periods of magnetic field disturbances and accompanying ionospheric storms, remain alert for very bad weather and other terrestrial upsets ... particularly on days surrounding the 2nd and the 19th.

10–12 meters

Possible openings to Europe in the morning, midday openings to Africa and South America, and late afternoon openings to Australasia and the South Pacific. Daytime short-skip openings between 1000 and 2000+ miles are likely as well.

15–17 meters

Worldwide DX possible during daylight hours, peaking toward Europe and the east in early morning, toward the southern hemisphere in the afternoon, and toward the west, South Pacific and Australasia in the late afternoon, with daytime short skip from 1000 to over 2000 miles.

20–30 meters

Openings to Europe and the east during late afternoon hours, with the bands remaining open to various areas of the world during hours of darkness until shortly after sunrise. Daylight short skip to 1000 miles and 2000 miles or so at night.

40 meters

Generally low noise prevails, and openings toward Europe and the east beginning in late afternoon, with the band remaining open all night until after sunrise to various areas of the world. Daytime short skip to about 1000 miles and over 1000 miles at night. This *could* be your best DX band this month!

80 meters

DX to all areas of the world between dark and dawn with signals peaking toward Europe and east around midnight, and to other directions just before dawn. Daytime short skip to 500 miles and nighttime openings to 2000 miles or so.

160 meters

DX possible during early evening and hours of darkness. No daytime short skip, but excellent possibilities at night from 500 to about 1500 miles.

Don't forget to work the *darkness path* (±30 minutes around local sunset).

Check the bands above and below the suggested ones for possible DX surprises. It's often a good idea to park your receiver on a seemingly unused frequency and just wait. A DX station is very likely to pop up before any one else hears him, and you can snag a good catch. Good hunting. W1XU/7.

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	15	20					20	20				15
ARGENTINA	20	40	40	40			20	15	15	10	10	15
AUSTRALIA	15	20	20		40	40	40			20	20	15
CANAL ZONE	20	20	20	20	20	20	20	15	10	10	15	15
ENGLAND	40	40	40	40		20	15	10	15	20	20	
HAWAII	15	20					20	20	20	10	10	15
INDIA .							20	20				
JAPAN	16	20					20	20				15
MEXICO	20	20	20	20	20	20	20	15	10	10	15	15
PHILIPPINES							20	20				
PUERTO RICO	20	20	20	20	20	20	20	15	10	10	15	15
RUSSIA (C.I.S.)							20	15	20	20		
SOUTH AFRICA	20	40					20	10	10	10	15	20
WEST COAST	15/20	20/40	80	160	160	160				10	10	15

CENTRAL UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	15							20				15
ARGENTINA	20	20	20	40	40		20	20	15	10	15	15
AUSTRALIA	15	20	20				40				15	10
CANAL ZONE	15	20	40	40	40		20	15	10	10	10	15
ENGLAND	40	40	80					20	15	15	20	40
HAWAII	15	20		40	40	40	40	20	20	15	10	15
INDIA								20				
JAPAN	15							20				15
MEXICO	15	20	40	40	40		20	15	10	10	10	15
PHILIPPINES	15	20						20				15
PUERTO RICO	15	20	40	40	40		20	15	10	10	10	15
RUSSIA (C.I.S.)								20	15	20		
SOUTH AFRICA	20	40						15	10	10	15	20

WESTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	10	15	20				40	40	40			20
ARGENTINA	15	20		40	40			20		10	10	15
AUSTRALIA	10	15	20	20			40	40	20	20	15	15
CANAL ZONE	15	20	20					20	15	10	10	10
ENGLAND	20	40	40						15	15	20	20
HAWAII	10	15	20	40	40	40		20	20	15	15	10
INDIA		15	20						20			
JAPAN	10	15	20				40	40	40			20
MEXICO	15	20	20					20	15	10	10	10
PHILIPPINES	10	15/20	15/20			40	40	40		20		20
PUERTO RICO	15	20	20				40	40	40			20
RUSSIA (C.I.S.)									20	20		
SOUTH AFRICA	20	20							15	10	15	15
EAST COAST	15/20	20/40	80	160	160	160				10	10	15

just more Chicken Little crapola. The sky isn't going to fall. The power grid isn't going to go down. The country's food-distribution system won't be disrupted. The millennium bug, as it's called, will just turn out to cause a few sneezes, not a plague.

However, in a recent poll of high-tech execs reported in *Newsweek*, 60% of them said that they would not fly on a commercial airline on Jan. 1, 2000. Hmm? 80% of them are documenting their financial records. 13% are upgrading their personal security (alarm systems, guns), 11% are stockpiling water and canned goods, 9% are buying generators and wood stoves,

Continued on page 64

Here are some of the books Wayne has written. Some can change your life, if you'll let them. If the idea of being healthy, wealthy and wise is of interest to you, start reading. Yes, you can be all that, but only when you know the secrets which Wayne has spent a lifetime uncovering.

Radio Bookshop

The Secret Guide to Health: Yes, there really is a secret to regaining your health and adding 30 to 60 years of healthy living to your life. The answer is simple, but it means making some very difficult changes. Will you be skiing the slopes of Aspen with me when you're 90 or doddering around a nursing home? Or pushing up daisies? No, I'm not selling any health products. $5 (H)

The Secret Guide to Wealth: Just as with health, you'll find that you have been brainwashed by "the system" into a pattern of life that will keep you from ever making much money and having the freedom to travel and do what you want. I explain how anyone can get a dream job with no college, no résumé, and even without any experience. I explain how you can get someone to happily pay you to learn what you need to know to start your own business. $5 (M)

The Secret Guide to Wisdom: This is a review of around a hundred books that will help you change your life. No, I don't sell these books. They're on a wide range of subjects and will help to make you a very interesting person. Wait'll you see some of the gems you've missed reading. $5 (B)

Cold Fusion Overview: This is both a brief history of cold fusion, which I predict will be one of the largest industries in the world in the 21st century, plus a simple explanation of how and why it works. This new field is going to generate a whole new bunch of billionaires, just as the personal computer industry did. $5 (C)

The Bioelectrifier Handbook: This explains how to build or buy a little electrical gadget that can help clean the blood of any virus, microbe, parasite, fungus or yeast. The process was discovered by scientists at the Albert Einstein College of Medicine, patented, and then hushed up. It's curing AIDS, hepatitis C, and a bunch of other serious illnesses. The circuit can be built for under $20 from the instructions in the book. $10 (A)

Moondoggle: After reading René's book, *NASA Mooned America*, I read everything I could find on our Moon landings. I watched the videos, looked carefully at the photos, read the astronaughts' biographies, and talked with some of my readers who worked for NASA. This book cites 25 good reasons I believe the whole Apollo program had to have been faked. $5 (D)

Mankind's Extinction Predictions: If any one of the experts who have written books predicting a soon-to-come catastrophe which will virtually wipe us all out are right, we're in trouble. In this book I explain about the various disaster scenarios, from Nostradamus, who says the poles will soon shift, wiping out 97% of mankind, to Sai Baba, who has recently warned his followers to get out of Japan and Australia before February 6th this year. The worst part of these predictions is the accuracy record of some of the experts. Will it be a pole shift, a new ice age, a massive solar flare, a comet or asteroid, or even Y2K? I'm getting ready, how about you? $5 (E)

Wayne's Submarine Adventures in WWII: Yes, I spent from 1943-1945 on a submarine, right in the middle of the war with Japan. We almost got sunk several times, and twice I was in the right place at the right time to save the boat. What's it really like to be depth charged? And what's the daily life aboard a submarine like? There are some very funny stories. If you're near Mobile, please visit the Drum. $5 (S)

Improving State Government: Here are 24 ways that almost any state government can cut expenses enormously, while providing far better services. I explain how any government bureau or department can be gotten to cut its expenses by at least 50% in three years and do it cooperatively and enthusiastically. I explain how, by applying a new technology, the state can make it possible to provide all needed services without having to levy *any* taxes at all! Read the book, run for your legislature, and let's get busy making this country work like its founders wanted it to. Don't leave this for "someone else" to do. $5 (L)

Travel Diaries: You can travel amazingly inexpensively – once you know the ropes.Enjoy Sherry and my budget visits to Europe, Russia, and a bunch of other interesting places. How about a first class flight to Munich, a rented Audi, driving to visit Vienna, Krakow in Poland (and the famous salt mines), Prague, back to Munich, and the first class flight home for two, all for under $1,000. Yes, when you know how you can travel inexpensively, and still stay in first class hotels. $5 (T)

Wayne's Caribbean Adventures: More budget travel stories – where I visit the hams and scuba dive most of the islands of the Caribbean. Like the special Liat fare which allowed us to visit 11 countries in 21 days, with me diving all but one of the islands, Guadeloupe, where the hams kept me so busy with parties I didn't have time to dive. $5 (U)

Silver Wire: With two 3" pieces of heavy pure silver wire + three 9V batteries you can make a thousand dollars worth of silver colloid. What do you do with it? It does what the antibiotics do, but germs can't adapt to it. Use it to get rid of germs on food, for skin fungus, warts, and even to drink. Read some books on the uses of silver colloid, it's like magic. $15 (Y)

Classical Music Guide: A list of 100 CDs which will provide you with an outstanding collection of the finest classical music ever written. This is what you need to help you reduce stress. Classical music also raises youngsters' IQs, helps plants grow faster, and will make you healthier. Just wait'll you hear some of Gotschalk's fabulous music! $5 (Z)

Reprints of My Editorials from *73*.

Grist I: 50 of my best non-ham oriented editorials from before 1997. $5 (F)

Grist II: 50 more choice non-ham editorials from before 1997. $5 (G)

1997 Editorials: 240 pages, 216 editorials discussing health, ideas for new businesses, exciting new books I've discovered, ways to cure our country's more serious problems, flight 800, the Oklahoma City bombing, more Moon madness, and so on. In three $5 volumes. $15 (O)

1999 Jan-Aug Editorials: 188 pages in two $5 volumes. Bringing you up to date. $10 (P)

Ham-to-Ham: 45 of my ham-oriented editorials. These will help you bone up on ham history. Great stuff for ham club newsletter filler. Yes, of course these are controversial. $5 (Q)

$1 Million Sales Video: How to generate extra million in sales using PR. This will be one of the best investments your business ever made. $43 (V)

One Hour CW: Using this sneaky method even *you* can learn the Morse Code in one hour and pass that dumb 5wpm Tech-Plus ham test. $5. (CW)

Code Tape (T5): This tape will teach you the letters, numbers and punctuation you need to know if you are going on to learn the code at 13 wpm or 20 wpm. $5 (T5)

Code Tape (T13): Once you know the code for the letters (T5) you can go immediately to copying 13 wpm code (using my system). This should only take two or three days. $5 (T13)

Code Tape (T20): Start right out at 20 wpm and master it in a weekend for your Extra Class license. $5 (T20)

Code Tape (T25): Same deal. It doesn't take any longer to handle 25 wpm as it does 13. Or use the ARRL system & take six momhs.$5 (T25)

Wayne Talks at Dayton: This is a 90-minute tape of the talk I'd have given at the Dayton, if invited. $5 (W1)

Wayne Talks at Tampa: This is the talk I gave at the Tampa Global Sciences conference. I cover cold fusion, amateur radio, health, books you should read, and so on. $5 (W2)

Stuff I didn't write, but you need:

NASA Mooned America: René makes an air-tight case that NASA faked the Moon landings. This book will convince even you. $25 (R1)

Last Skeptic of Science: This is René's book where he debunks a bunch of accepted scientific beliefs – such as the ice ages, the Earth being a magnet, the Moon causing the tides, and etc. $25 (R2)

Elemental Energy Subscription: I predict this is going to be the largest industry in the world in about 20-30 years. They laughed at me when I predicted the personal computer growth in 1975. PCs are now the third largest industry in the world. The elemental energy ground floor is still wide open, but then that might mean giving up watching ball games and talk shows on the boob tube. $30 for six issues. (EE). A sample issue is $10.

Three Gatto Talks: A prize-winning teacher explains what's wrong with American schools and why our kids are not being educated. Why are Swedish youngsters, who start school at 7 years of age, leaving our kids in the dust? Our kids are intentionally being dumbed down by our school system — the least effective and most expensive in the world. $5 (K)

......Wayne

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____________ US$________

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MC/Visa for orders over $10. #____________ Expire ____

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Yes! Put me down for a year of *73* for only $25 (a steal). Canada US$32. Foreign US$44 by sea, US$67 by air. Whew!

Number 64 on your Feedback card

Barter 'n' Buy

Turn your old ham and computer gear into cash now. Sure, you can wait for a hamfest to try and dump it, but you know you'll get a far more realistic price if you have it out where 100,000 active ham potential buyers can see it, rather than the few hundred local hams who come by a flea market table. Check your attic, garage, cellar and closet shelves and get cash for your ham and computer gear before it's too old to sell. You know you're not going to use it again, so why leave it for your widow to throw out? That stuff isn't getting any younger!

The *73* Flea Market, Barter 'n' Buy, costs you peanuts (almost)—comes to 35 cents a word for individual (noncommercial!) ads and $1.00 a word for commercial ads. Don't plan on telling a long story. Use abbreviations, cram it in. But be honest. There are plenty of hams who love to fix things, so if it doesn't work, say so.

Make your list, count the words, including your call, address and phone number. Include a check or your credit card number and expiration. If you're placing a commercial ad, include an additional phone number, separate from your ad.

This is a monthly magazine, not a daily newspaper, so figure a couple months before the action starts; then be prepared. If you get too many calls, you priced it low. If you don't get many calls, too high.

So get busy. Blow the dust off, check everything out, make sure it still works right and maybe you can help make a ham newcomer or retired old timer happy with that rig you're not using now. Or you might get busy on your computer and put together a list of small gear/parts to send to those interested?

Send your ads and payment to: *73 Magazine*, Barter 'n' Buy, 70 Rt. 202N, Peterborough NH 03458 and get set for the phone calls. The deadline for the May 1999 classified ad section is March 10, 1999.

President Clinton probably doesn't have a copy of *Tormet's Electronics Bench Reference* but you should. check it out at **[www.ohio.net/~rtormet/index.htm]**—over 100 pages of circuits, tables, RF design information, sources, etc. BNB530

BIOELECTRIFIER™ 5 Hz micro current supply for plant and animal research. Semi-Kit $38.00. Assembled complete with batteries and silver electrodes $89.50. Add $2.50 postage. **Thomas Miller**, 314 South 9th Street, Richmond IN 47374. BNB343

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Cash for Collins: Buy any Collins Equipment. **Leo KJ6HI.** Tel./FAX (310) 670-6969. [radioleo@earthlink.net] BNB425

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METHOD TO LEARN MORSE CODE FAST AND WITHOUT HANGUPS Johan N3RF. Send $1.00 & SASE. SVANHOLM RESEARCH LABORATORIES, P.O. Box 81, Washington DC 20044 USA. BNB421

WWII MILITARY TELEVISION WANTED: Army/Navy SCR, ATJ, ATK, ARK, ARJ, CEK, CRV. Receivers, cameras, monitor, transmitters, dynamotors. **Maurice Schechter**, 590 Willis Ave., Williston Park NY 11596, P/F (516) 294-4416. BNB69

QSL CARDS. Basic Styles; Black and White and Color Picture Cards; Custom Printed. Send 2 stamps for samples and literature. RAUM'S, 8617 Orchard Rd., Coopersburg PA 18036. Phone or FAX (215) 679-7238. BNB519

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TELEGRAPH COLLECTOR'S PRICE GUIDE: 250 pictures/prices. $12 postpaid. **ARTIFAX BOOKS**, Box 88, Maynard MA 01754. Telegraph Museum: [http://wltp.com]. BNB113

HEATH COMPANY is selling photocopies of most Heathkit manuals. Only authorized source for copyright manuals. **Phone:** (616) 925-5899, 8–4 ET. BNB964

Orlando HamCation™ and Computer Show Feb. 12–14, Central Florida Fairgrounds. ARRL North Florida Section. Commercial areas feature over 200 vendors, and swap area includes over 400 tables. Tailgating, forums, testing. Overnight RV parking with electric and water. Commercial Information, Tim Starr, (407) 850-9258. E-mail [AE4NJ@aol.com], visit our Web Pages at [WWW.OARC.ORG] or send SASE to: **Orlando HamCation™**, P.O. Box 547811, Orlando FL 32854. BNB213

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WANTED: NYE VIKING STATION MONITOR RFM-003, RFM-005. Paying $600. Randy Ballard N5WV, **(903) 687-3002**; [TMT@Prysm.net]. BNB5001

Great New Reference Manual with over 100 pgs of P/S, transistor, radio, op-amp, antenna designs, coil winding tables, etc. See details at [www.ohio.net/~rtormet/index.htm] or send check or M.O. for $19.95 + $2.00 postage and handling to RMT Engineering, 6863 Buffham Rd., Seville OH 44273. BNB202

NEVER SAY DIE

continued from page 62

and 3% are relocating to a nonurban environment.

A prudent person might look at those statistics and wonder: What do all those high-tech execs know that I don't?

No one knows what's really going to happen, but it seems as if the more people understand the depth of the problem, the more they are likely to be preparing for some pretty bad stuff.

I hope the pollster continues to check high-tech execs to see whether the preparedness curve is going up or down as the critical day approaches and the potential for serious trouble soaks in.

Unfortunately, just the fear of what could happen can be enough to make our financial system collapse ... if enough people sell their stocks — just in case. If enough try to withdraw their savings from their banks — just in case. Down could come the whole financial house of cards. The stock market only works when there are more buyers than sellers. And banks only stay in business if you don't try to get your money back. And this run on the stock market and banks could be triggered from anywhere in the world, which is really scary when you understand that, as unprepared as our computer people are for the problem, we're way *ahead* of all the other countries.

Let's see, should I call Wayne and see if he's got some space on his farm I can rent to park an RV for next year-end? January One comes on a Saturday — what will the world be like by Monday, the third? We can't send Bruce Willis to get rid of this threat.

Oh yes, Ed Yourdon, the author of *Time Bomb 2000*, sold his New York apartment and moved to New Mexico.

Editorial Reprints

It's highly unlikely that you know anyone who is into reading and thinking, but if you do know any such weirdos you could help encourage this deviant behavior by laying reprints of my editorials on them. I've reprinted my complete editorials for 1997 and 1998, each in three four-month volumes. They're $5 per volume. The 1997 editorials run to 320 pages. 1998 runs 240 pages. When I get some time I'll separate the ham-radio-oriented stuff and reprint the rest, as I have with the pre-1997 editorials — *Grist I and Grist II*.

If you meet any hams who are into thinking, please let 'em know about *73*.

MARCH 1999
ISSUE #462
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CANADA $4.95

73 Amateur Radio Today

Talk About a Cold Reception!

AL7PJ, page 30

QRP Kit Survey (Y2K precaution?)

Ferrite Loop Xmtg Antenna (yep!)

Filter Design for Dummies

CW: A Better Fist

CW: How to Have More Fun

03
0 74851 08725 1

MARCH 1999
ISSUE #462

73 Amateur Radio Today

TABLE OF CONTENTS

Business Office
Editorial - Advertising - Circulation
Feedback - Product Reviews
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REVIEW

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On the cover: Randy AL7PJ kept his cool while sending "Signals From the Ice" (page 20). Photo by KL7JR. We are always looking for interesting articles and cover photos—with or without each other. Your name could be in this space *next* month, and our check could be on its way to *you!* You couldn't use a little extra cash?

Feedback: Any circuit works better with feedback, so please take the time to report on how much you like, hate, or don't care one way or the other about the articles and columns in this issue. G = great!, O = okay, and U = ugh. The G's and O's will be continued. Enough U's and it's Silent Keysville. Hey, this is *your* communications medium, so don't just sit there scratching your...er...head. FYI: Feedback "number" is usually the page number on which the article or column starts.

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Number 1 on your Feedback card

NEVER SAY DIE

Wayne Green W2NSD/1
W2NSD@aol.com

How Come?

Yeah, how come Wayne is writing all these long editorials? One thing I haven't done in all my 48 years of writing editorials is give some background as to how I happened. Well, I figured my readers would be more interested in what I had to say about things than about me personally.

I was born in 1922 in Littleton, New Hampshire. My mother was a commercial artist and my dad was an aviator with the Army Air Force, stationed at Langley Field, Virginia. He took me up in a Martin bomber when I was about two months old, so I got an early start.

My great grandfather was a pioneer in homeopathy. He was the town doctor in Littleton, where my father also was born. A Green published the first Bible in America, and Greens founded Greene County, NY and Green County, MI. A Greene also founded Rhode Island, but it's a small state, so that probably isn't very important.

By an odd coincidence, all of my ancestors, from every branch of the family, came over here before 1700. Pioneers.

My grandfather was an inventor. A successful inventor. It was his inventions that got Citgo started back in 1910, and during the depression in the 1930s he turned Continental Can around, saving them from bankruptcy.

So I was ripe for amateur radio when I was a kid and started building radios when I was 15. By 16 I was busy making contacts on 40m CW. But it was the frontiers of amateur radio that attracted me. Pioneering blood, maybe. By 1939 I'd built a 2-1/2m walkie-talkie. This interest in radio naturally got me into a technical university, Rensselaer. And then, when World War II came along, into the Navy as an electronics technician. I volunteered for submarine duty, where I served from 1943–1945. Then they transferred me to the submarine school in New London, CT to teach electronics.

After the war I went back to college, where I was the president of the radio club and founded WRPI, the campus radio station. Today that's the biggest student activity.

After college I worked as a radio engineer and DJ, then as chief cameraman at WPIX in New York and as a TV director at KBTV in Dallas and WXEL in Cleveland.

I got certificated and worked as a professional psychologist. I worked on a color organ on a Guggenheim Grant, and as the Secretary of the Music Research Institute, where I wrote my first book, *Music For Your Moods.*

But I was more interested in pioneering new ham modes, so when I heard about narrowband FM in 1946, I immediately got on the air with it. That's now the standard for VHF communication.

When sideband came along, as the editor of *CQ*, I pushed that.

I don't want to turn this into a full-fledged biography, so I'll end there. I just wanted to give you an idea of how I got the way I am.

Iconoclast

My dictionary defines an iconoclast as someone who attacks conventional or cherished beliefs and institutions as being false or harmful. Hey, that's me! I am definitely an iconoclast! And the more I look into things (that's called research), the more I find I'm disbelieving conventional institutions. And yes, these institutions and beliefs are harming us. And they're false. But we've all been hoodwinked (a.k.a. brainwashed, hypnotized) into believing in them.

We are taught from the earliest childhood by our parents, our peers, neighbors and the media to believe in the goodness of mom and apple pie. We're thoroughly inculcated with beliefs that are making us sick, robbing us of 20–30 years of life, and keeping us from making much money.

We believe in our school system. Oh, we know it has some problems. More money might fix them, right? And we believe in doctors. Sure, there are some quacks. We believe in our food suppliers who are providing us with "enriched" and "lite" products, and we're protected by the FDA. Most of us don't believe our government would lie to us about really important things. Of course there are a few conspiracy nuts who are forever trying to make trouble over the Fed, the Illuminati, the National Security Council, the New World Order, and so on. And we have a few atheists who (gulp!) don't believe in God. That reminds me of the atheist in the funeral parlor — all dressed up and no place to go.

Then there are the government cover-ups such as the UFOs and ETs, and the Amelia Earhart disappearance, which I knew personally about. Could the Apollo Moon visits have all been faked?

We're being bought off with entertainment to keep us too busy to figure things out. How much of your life is spent working, sleeping and being entertained? The average family, according to the latest research, watches TV seven hours a day!

As a registered iconoclast I question the conventional wisdom (stupidity?) about farming, the food industry, the IRS/FDA/AMA/ADA, our money, the American Cancer Society, doctors, hospitals, NASA, Congress, Clinton, the pharmaceutical industry, immunization, alternative health, the military, the war on drugs, the war on poverty, public schools, colleges, religions, the music industry, sports, radio, TV, newspapers, news magazines, the dangers of pot, insurance, banks, psychiatry, milk, sugar, white flour, cooking, dental amalgam, NutraSweet, big business, lawyers, judges, most jobs, prisons, UFO/ET debunking, unions, fluoridation, global warming, the ozone hole, tobacco, liquor, coffee, property taxes, Social Security, environmentalism, freon's hazards, the pyramids' age, dowsing debunking, reincarnation debunking, foreign aid, public water supplies, Medicare, and so on. I'll think of more.

Unless you're a newcomer to these pages, you've read my exposés of all of the above. And more.

Opportunity

There it is, knocking again — quick, get your ear plugs. Say, what does it take to get you off dead center? Out of that couch with the TV turned off? Hello?

There's a great opportunity that's wide open right now that could be started with a micro loan and built into an international multi-billion dollar chain. Please don't make me do it! I want to keep doing

73 and my cold fusion journal, and write books. Oh, I'd like to have the freedom to visit another 70 countries, to ski and scuba dive around the world. So please don't, through your laziness and lack of motivation, force me to get this business started myself. I have this problem with seeing something that "someone" should do and, lacking a someone, I say what the hell and do it.

Okay, let's get down to business here. Look, there are tens of thousands of day care centers, so who needs more, right? Only any parents who have a serious interest in the development of their children. Sometimes I get the feeling that all too many parents find their children a terrible nuisance. They let day care centers babysit them during the day and hire a babysitter at night. Then, when they get to be five, they put 'em into kindergarten and let schools do the day care. They even provide transportation.

I don't mean to be critical (I'm lying), but if you'll spend a crummy seven bucks and get the Pocket Book *How to Raise a Brighter Child* by Joan Beck, you'll find out that if a child is provided with the right learning materials and stimuli at the right time for the child's brain and coordination development, it's easy to increase a child's IQ by 20 or more points. This is early learning that's not available in many (if any) day care outfits.

You say your child's day care center is excellent? Sure, then tell me how many languages your child was taught between the ages of one and three. That's when kids are able to learn just about any number of languages, to speak them without an accent, and to think in each of the languages, switching from one to the other with ease. After three, this learning opportunity is over. Zip, gone.

There are similar periods in a child's development when it quickly and eagerly learns certain things that will never be as easy to learn later. Windows of learning and development opportunity are opening and closing (permanently) while you are putting it in storage at a day care center.

The super day care center of the 21st century will check your child to see when it is ready to learn what, and then give it the attention and exposure needed to build those skills. It will have native-speaking people to teach the children a dozen or so languages. Kids can (and will love to) learn to read and write by four, if permitted. And so on it goes, but only if the kids have the attention they need.

In these days when it takes both parents to make as much money as one used to make, day care centers are needed. Virtually no parents are equipped to teach their children a dozen languages, so there will be a need for that, if nothing else.

Children love to learn. They're interested in everything and, if permitted, will absorb an amazing amount of information. Kids love to learn to identify flowers and trees, animals, stars, and so on. They want to know about everything they can see, hear, feel and taste. It's natural. Instead, many parents imprison their kids in playpens or cribs during the time when their learning ability is trying to explode outward. They sedate and stupefy them with TV. If your kid has an opportunity to play with a piano or other musical instruments at three and four, the opportunity should be there. When I was six, I wanted to learn to play the piano and my father almost had to beat me to stop that nonsense. Later, friends heard of my interest and gave me their old piano. My dad had it hauled off and thrown away so he wouldn't have to listen to me practice. Oh well, I guess there isn't any big need for another composer anyway.

That's an extreme case, but are you doing something similar to your kids?

So how about getting together with some other parents and starting a super day care center? And then cloning it!

I've found several more superb books on the subject you'll want to read if I can get you off the couch.

Medical Research

Yesterday a ham whom I'd met at the Peoria Hamfest stopped by to visit, bringing along two radionics machines and a colored light system. He had a long list of amazing cures he'd achieved with them. So, how much do you know about radionics? They're similar to Hieronymus Machines, which were first described in *Analog* back around 1956. Hulda Clark explains how to build one in her *A Cure For All Illnesses*. That's a book that I don't recommend, by the way. I've written about these gadgets in the past, but I don't recall ever getting any encouraging reader feedback. How about using colored lights to cure illnesses? How can that possibly work?

Today I talked with a couple of people who are using Rife technology machines and also claim to be having some consistent cures for illnesses. I've written about Royal Raymond Rife, his incredible microscopes, and his approach to curing illnesses before, too, so I won't go into all that again. Basically, Rife found that specific radio frequencies would demolish pathogens.

I've also some books on the Lakhovsky Multi-Wave Oscillator, citing some remarkable results using it.

I've a friend who is achieving cures and healing with magnets.

What I don't have are any scientific double-blind studies of these approaches to healing. If any of them work, our medical establishment should investigate them and develop their designs and applications.

The medical establishment has a long and virtually unblemished history of ignoring new ideas for as long as possible, and crucifying their proponents. The pharmaceutical industry, which has a tight hold on the medical industry's jugular when it comes to implementing any cost-cutting developments, has a basic rule — if we can't patent it and charge top dollar for it, you ain't gonna get it.

So, what do you know about radionics? Rife machines, Lakhovsky MWOs, magnets, colored lights, and other alternative devices which may be able to help repair our bodies for us?

Perhaps I should add stuff like carbon dioxide, hydrogen peroxide, UV light, the Bioelectrifier™, silver colloid, and other such healing technologies. Well, they all should be honestly investigated and tested, no matter how crazy they seem.

Between our paying around double what any other country has to pay for health care and getting poorer results than some third-world countries provide, it's time for some group to blow the whistle. Congress, whose kitty is well fed by the medical industry lobbyists, isn't about to rock the boat. Perhaps we need to set up a consumer's cooperative which could then bring a class action suit against the AMA, FDA, our hospitals, and the pharmaceutical industry for a couple trillion dollars for malpractice.

The fact is that we have a long way to go in understanding the mysteries of our bodies. Microelectric currents and magnetic fields seem able to even help regrow bones.

There's dowsing, which has been scientifically proven to work, but for which we have no logical explanation. And that is also true of psychokinesis, psychometry, precognition, remote viewing, and so on.

You don't even have to take my word, or the word of the researchers on whom I'm depending for my data, that all these things are real. You can learn to dowse, or any other of the above things you would rather reject as crazy. It's an ability that everyone seems to have. A latent ability that thrives when exercised. Look here, cheapskate, spend $7 for Bevy Jargers' new pocket book on the subject. It's an instruction manual that

Continued on page 59

LETTERS

From the Ham Shack

Dave Miller NZ9E. I agree completely with your editorial take on the illegal drug problem ("Never Say Die," January 1999, page 60). By making buying and possessing drugs a crime, the government has only escalated the price, made drugs more appealing to those who enjoy the dare and the danger, and increased the possibility of an addict buying poorly handled or tainted drugs. It hasn't done a thing to solve the real problem.

The government doesn't seem to *get it*. Illegal drug usage isn't a crime, it's a vice.

There's a big difference between a crime and a vice. A crime occurs when an innocent victim is the *object* of the action—such as in robbery, rape, or murder. The innocent party is directly targeted. With a vice, the victim is oneself. Excessive drinking is a vice, so is smoking, overeating, gambling, prostitution, and any other self-destructive behavior. But they're not crimes. Even though people will say, "Isn't it a crime that so and so is involved in that," that's just an expression. It isn't a crime against society, it's a self-abusive vice. Our leaders have to come to terms with the distinction. As you wrote in your editorial, Prohibition—which made manufacturing, selling, buying and using alcoholic beverages a crime back in the '20s—was a complete flop. Why? Because alcoholism is a vice, not a crime. The government finally realized that (albeit 13 years after passing the Prohibition amendment).

Criminalizing vices is always unproductive and often cataclysmic, as we're now finding out with the War on Drugs. Education, along with recognizing and treating addictive personality traits, is a much better answer. We're finally at the point where we recognize that eating disorders, gambling addiction and alcoholism are treatable illnesses. When will we recognize illicit drug addiction as the same?

Switzerland is now doing just that. The Swiss have a program in place that will supply (for virtually no money) hard drugs to addicts who come to the approved clinics for their "fixes." The Swiss are still coming down hard on the street sellers, but those street sellers will no doubt soon disappear because of the practically free alternative. The addicts themselves are of course happy with the idea, but also say that they're striving to get off of drugs because it's no longer "fun"—the daring and "coolness" is gone. And that's exactly what the Swiss authorities want, to make drugs "uncool." The Swiss are handling drug addiction as a treatable vice, not a crime. Selling drugs is a different story, but using them is looked at as a human weakness, not a criminal act. The victims are the users themselves, just as with any other vice.

Oh sure, there are innocent victims associated with vices, too—the innocent parties that can be killed when an alcoholic is driving drunk, the family members of an addicted gambler who can't afford to put food on the table, even those who suffer the effects of second-hand smoke from cigar and cigarette smokers, but these victims are not the direct targets of the vice—the fallout they suffer is primarily unintended. In a crime, the victim is the object of the crime; in a vice, any second or third party victimization is accidental, that is to say, they're not the target of the action. A vice is perpetrated on oneself. It's time that our government faced that fact in its "War on Drugs."

And just look at what our politically-inspired drug war has done to countries like Mexico and Colombia! The huge drug profits our government has made possible has poisoned the politics and economies of many Caribbean countries, as well as high officials in American agencies. If you think I'm exaggerating even a little, please read the well-researched book I recommended, Drug Crazy ... *Wayne.*

Frank Rumph KD4DZI. There was a woman in the local paper who had AIDS. She was in the paper about a year ago, too. I called her and offered to give her my Bioelectrifier™. She asked for the information first, so I sent it to her. It's been a month now and I haven't heard from her. If I had an incurable disease I would try anything that came along. I don't understand people like her who are waiting for a miracle cure that may never come. In the meantime she is taking a diet of pills just to live. A year ago I offered it to the local AIDS group and never heard any more.

Frank, now you know how frustrated I feel! Between the Bioelectrifier for emergencies and a change of diet, I'm now convinced that any illness can be overcome — as I explain in my Secret Guide to Health ... *Wayne.*

The New Machine!

When Les Earnshaw demonstrated the new Kachina at Dayton, you can bet that the competition was all eyes, ears, and cameras. Well, this is the first really new development in ham gear in about 30 years — since the advent of sideband, solid state, and synthesized tuning. How long will it take before we see Japanese copies?

What I'd like to get is some letters from Kachina users — from the kind of hams who are the first to try new technologies, while everyone else waits. How totally has our public school system killed the pioneering spirit which got our country started just over a couple hundred years ago?

How about it, guys? Are you having a ball with your Kachina? Tell us about it! Let's see some letters.

For that matter, I'd love to see letters from any of you who are trying new stuff. Are you having a ball with slow scan, packet, RTTY, or what? Help me to get others out of their ruts and enjoying the excitement amateur radio has to offer! ... Wayne.

Micheal D. Smith, Sr. WD4KMP. The "QRPeanut" of James Fisher (*73*, December 1998) is a great idea, but, as he said, acts as a high-pass filter and will not attenuate harmonics. There is a simple and easy solution: Add a variable capacitor in parallel with the shunt inductor.

This is mentioned in Joseph Carr's *Practical Antenna Handbook* of 1994, on page 401 (illustration 19-7).

I know that many people will build and enjoy this easy-to-make circuit. They'll enjoy it even more when this simple modification gets rid of the harmonics (and FCC pink slips!).

QRX . . .

Cutbacks in Connecticut

The ARRL is cutting back the size of *QST Magazine* as amateur radio's dwindling numbers take their toll, according to a message to Section Managers from League Field Services Manager Rick Palm K1CE. Several areas of the magazine will be cut back; the space allotted for Section News will be reduced by 15%.

Palm's message paints a grim picture for amateur radio as it faces the next century. Palm said the annual number of new licensees has dropped dramatically over the past two or three years. As a result, overall VEC exam activity is down about 25% from last year, and there are other signs of the decline, including the bitter economic conditions amateur radio equipment dealers face, as evidenced by the many businesses that have closed during the past three years.

Since March 1997, Palm says that the ARRL has seen its overall membership numbers fall by more than 14,000 or about 8%. He says the reasons for this drop are varied, and include the traditional reaction to a dues increase. But more challenging to amateur radio's future are strong indications that Technician class licensees are not finding much to keep them interested in amateur radio or to compel them to be members.

Two years ago, Palm says, hams were joining the League in large numbers in response to spectrum threats. But a year later, almost 50% have not renewed. Palm says there could be several reasons—a combination of the last dues increase, the perception that the threats to the spectrum have abated, a lack of interest by hams in what the ARRL is offering—or just simply defections from amateur radio.

But Palm does leave the Section Managers with an optimistic note. He says that once the uncertainty surrounding FCC license restructuring is past, the situation should improve. In the meantime, though, the ARRL has to take action in the wake of falling numbers.

Austerity moves include the cancellation of the long-running VHF and UHF Spring Sprints. These mini-contests are traditionally held during April and May. ARRL contest branch manager Dan Henderson N1ND cites a lack of participation for the change. He says that in 1998 only 200 people submitted logs and those submitted were spread across the seven frequency bands covered by the Sprints. With so few people taking part, the sprints are just too expensive to subsidize in these tight economic times.

And in another cost-cutting move, the ARRL has merged its Field Services and Educational Activities departments. The new Field and Educational Services Department came into existence on January 4th. The new department brings together staff members with a similar mission: the support of ARRL volunteers who, in turn, promote ham radio on a local and regional level.

Like the decision to abandon the VHF and UHF Sprints, this move also was designed to reduce expenses In the face of a decline in both ARRL membership and overall amateur radio licensing and activity over the past few years. Former Educational Activities department manager Rosalie White WA1STO has assumed the title of Educational Services Manager. She will oversee day-to-day operation of the new department and will continue as the primary staff contact for amateur radio in space issues.

From ARRL via *Newsline*, Bill Pasternak WA6ITF, editor.

Hams Respond As Killer Tornadoes Rake South

Hams in Tennessee and Arkansas responded as unusual tornadoes threatened, then struck, in January. A call went out January 22nd for additional ham radio volunteers to assist emergency operations in Tennessee in the storms' wake.

Tornadoes in the Jackson, Tennessee, area January 17th killed eight people. Another eight died when tornadoes struck in the vicinity of Little Rock and White County, Arkansas, January 21st. The National Weather Service called it "an unprecedented outbreak of tornadoes for January."

Arkansas Section Manager Roger Gray N5QS, in Searcy, reported that he was up all night and observed four or five funnel clouds, but he estimated that at least 30 tornadoes swept through the area. Gray has been actively managing the ARES operation. "We have had an incredible response from the amateur community," he said. He estimated that up to 60 hams were active on VHF and HF nets. Amateur radio filled the gap as long-distance telephone circuits have became overloaded.

"Another wild night in Arkansas," said ARRL Vice President Joel Harrison W5ZN, in Judsonia, who reported "lots of damage" in his area. "I have to tell you, in my 41 years of living here I have never seen storms like we had last night," he said the following day. Harrison said the first line came through around 5 p.m., "then another, and another, and another, for what seemed like every half hour till about 10:30 p.m.

"The damage in a 10-mile radius around my home is horrible," Harrison said. Arkansas State University in Beebe—where his son, Mark, attends school—had extensive damage. "There is considerable damage in Little Rock, even to the governor's mansion," he added.

Mark Harrison KC5YNE said most of the town of Beebe was damaged or destroyed, and eight tornadoes hit White County alone. He reported that the family had spent an anxious night. "It was a relief when the storms finally quit, and everything was fine here," he said.

Meanwhile, Delta Division Vice Director Henry Leggette WD4Q, in Memphis, Tennessee, reported considerable ham radio activity in the Jackson area, as well as in Clarksville, where twisters struck early on the morning of January 21st. Leggette said he planned to visit the Jackson area over the weekend to assist.

Tennessee SEC Jim Jarvis WD4JJ, In Bristol, relayed a request for amateurs with mobile units to assist at the Clarksville/Montgomery County Emergency Operations Center. Hams willing to volunteer may contact the EOC directly on the 147.39 MHz repeater, he said. "The police department and city hall have been completely demolished, and the downtown area is a complete wreck." Jarvis also reported damage in Humphreys County, as well as in McEwen, Waverly, and Camden counties. He estimated that up to three dozen hams were active in providing emergency communication in the Clarksville/Montgomery County area.

In the aftermath of the earlier storms, Jarvis reports that EC Kenny Johns AB4EG, in Jackson, was rounding up volunteers to assist the Red Cross with damage assessment in the seven counties hit in mid-month. Johns said a SKYWARN net was activated Sunday, January 17th, but the tornadoes were unexpected. After the storms struck, more than two dozen ARES members handled health-and-welfare traffic at the EOC for 22 hours.

From the ARRL, via the February 1999 issue of *Radio Flyer*, UBET ARC newsletter, Dennis Hardy KC7MCR and Mike Bignell KC7SWH, co-editors.

California Ham Instrumental in Arrest of Dangerous Road Rage Suspect

A member of a California ham family was indispensable in helping police to arrest an angry motorist who had seriously injured another motorist after being cut off on the freeway last December.

According to an account in *The Orange County Register*, the irate motorist followed the other driver for miles before confronting him on a busy city street. He allegedly shoved his victim under an accelerating big rig tractor-trailer and then kicked him even after he had been run over.

The account says that the furious driver and his two co-workers drove off. They were caught later in the morning when Ed Greany KB6DOL, of Corona, heard a broadcast description of the vehicle and then saw the men pass by. He notified police via ham radio. They arrested Richard

Continued on page 40

The Pluck of the Irish

Was Wee Mac a leprechaun or a pirate—or both?

Guy Slaughter K9AZG
753 W. Elizabeth Drive
Crown Point IN 46307

Never work a leprechaun. If you hear one on frequency, QSY. If he's calling you, QRT. Quickly!

I wish someone had told *me* that before I got involved with Wee Mac. It could have saved me a lot of grief.

So, you ask, how can you tell a leprechaun when you hear one? Rule of thumb: Shun all falsetto-voiced phone ops with AC hum on their signals, and avoid all funny-fisted CW guys with rough and chowpy notes.

It's not *only* leprechauns, of course, who sound like that, but abstention from contacts with *all* such ops is the safe way to go. Besides, it'll make our bands better. See, if we boycott non-leprechaun lids because they *sound* like leprechauns, we'll motivate them to force their voice registers downhill, to improve their CW, to clean up their signals, and thus to upgrade into non-lids.

Leprechauns, however, can't do this. Their vocal cords are too teensy to vibrate in human-voice ranges, their fingers are too dinky for our keying devices, and they can't prevent their magnetic-flux auras from hum-modulating RF.

What the little buggers *can* do, though, is give you trouble. Let me tell you about mine.

I was on 20 CW when I heard this rough and chowpy signal calling me as I was wrapping up a QSO with a DL2. It signed an EI call. I was tempted to ignore it, intending to shut down the rig in favor of a trip to the bathroom. Instead, I came back to the caller, thanked him for the shout, and gave him a 597C report. That was a tragic mistake.

"RR Guy in Indiana/ur 589 589 in Dublin Dublin/nyme is Mac Mac/why the T7C? AR BK," the EI said, chowping along at around 25 words per with a really rotten fist and a terrible AC growl on his note.

"BK sri Mac fer the bum rpt," I told him. "I thot ud want to knw ur loud sig is a lil ruff and chirpy here. BK."

"Ur rcvr always block on strong sigs?"

"No no no/rcvr not blocking/other strong sigs snd FB. BK."

"In ur nose with a ruddy hose/AK SK," says the EI, and he's gone.

I mentally tagged the guy a sorehead, punched the QSO data into the log, hit the big switch, and headed for the bathroom, wondering why I was suddenly sneezing so hard that my nose began to bleed.

Two hours later, with my nosebleed finally stopped, I heard the EI on again. This time his note was clean and chirpless. I gave him a 589X when he acknowledged my call, adding, "Ur sig DC Mac/no sign of chirp/note clean and pure/K."

"TU fer rept," says the EI. "Name is Jigger Jigger in Dublin Dublin/why the big deal on the DC sig? BK."

"Thot op was Mac," I say. "This a club station? BK."

"No no no/personal station in my home/op is Jigger Jigger/pse who Mac?"

"Beats me," I say. "QSO'd your call earlier today/note was chirpy es buzzy/ op with funny fist sed his name Mac."

"Was not me," says the EI. "Been getting QSLs for QSOs not in log/cards say TU Mac/spose I have pirate?"

"Bet on it," I say. "Too bad/GL es hpe CU agn/DX es gud rpts/73 AR SK."

And that was that, right? Wrong.

The next day, I was wrapping up with an HB9 on 15 sideband when I heard a high-pitched voice calling me in a thick Irish brogue. He had a terrible AC growl on his signal. He signed that same EI call.

"Hi, Jigger," I said, coming back to him. "I'm glad to see you again so

soon. You're five-by-nine with AC hum in Indiana. Name's Guy, golf uniform yankee. We've worked before on CW. You find your pirate yet? Go."

"Me nyme is Mac," the EI warbles, his voice a good octave above high C. "Poirate, indade. Air ye sayin' Oi've got me a poirate nyme o' Jigger workin' me stayshun when Oi'm not aboot?"

"Maybe yes, maybe no," I tell him. "An op named Jigger signing the same call said *he's* got a pirate named Mac. Could you be it?"

"In yer oye with a monster stoy," my contact says, falsetto voice, the hum modulation making his words doubly harsh. "Over 'n' out, me smart-mouthin' bucko."

And even while I observed the amenities by mumbling my best 73 and wishing Mac a nice weekend anyway, my vision started to blur, my left eyelid began to swell, and the pain came. Though I had never had a sty before in my life, I was growing a beauty now. In minutes, my lower lid swelled up so big I had to stand on tiptoe to see over it.

The cure cost me 60 bucks and a couple of sleepless nights. The doctor, to whom I didn't mention Mac, said it was an infection of a sebaceous gland, not uncommon in a polluted world. He seemed surprised at my questions, and declined to attribute my eyelid problem to a hex, a voodoo, a hoodoo, or self-induced psychosomatic auto-hypnotic anxiety.

It was a month later, the day before St. Patrick's Day, when I ran across the EI again on 15 sideband. He was chatting with a W1. His voice was baritone, his modulation crisp and clean. I waited for him to clear, and gave him a shout. It was Jigger. He didn't remember me until I asked him if he still suspected he had a pirate.

"Not suspected," he said. "Had me one. Caught 'im in the bleedin' shack. Over."

"In your shack?" I asked. "Not only using your call, but actually working your rig?"

"Affirmative," Jigger said. "Repeatedly,

Continued on page 12

I kept comin' 'ome from the office to find 'im 'ere."

"That's incredible," I said.

"Agreed," said Jigger. "But I'm pretty sure I got rid of 'im fer good, finally."

"You had him arrested?"

"Who can arrest a wee one?"

"A wee one? He was a kid? A midget?"

"Negative. Nayther a young one near a small one. A *wee* one."

"You mean like a goblin? An elf? A gnome?"

"A leprechaun," Jigger said. "Wee Mac's a bleedin' leprechaun. It's been nice. Hope to see you again, old man. Seven-three." And he was gone.

That, as I said, was the afternoon before St. Patrick's Day. I wrote a little note in my log questioning the mental condition of the EI who figured he'd gotten rid of the leprechaun he imagined had taken over his shack, and went upstairs to dinner.

When I came home from work the next day, I noticed the tribander was pointing south. I usually leave it aimed northeast so the elements are end-on to the prevailing wind. I must have goofed, I figured. My wife was setting the table in the kitchen. She looked startled when I came in.

"I thought you were in the basement," she said.

"Nuh uh," I said brightly. "I'm right here. How was school?"

"Okay, I just got home, myself. I thought I heard you in the shack."

"Premature *déjà vu*," I told her. "You're about to. I need to swing the beam around."

My shack is at the far end of the basement from the kitchen stairway. I leave its door open for heat circulation. Now it was closed. I could see a crack of light beneath it. I could hear the bleeping of my transceiver's CW sidetone, its note strangely rough and chirpy. Curiosity and anger tumbled through me in waves. Surely Jigger's pirate wouldn't have the gall ...

I flung open the door. The sidetone halted in mid-chirp. I caught a glimpse of a doll-sized figure standing on my chair, leaning across the operating table to grasp the keyer paddle on its far edge. Then the apparition was gone. For an instant I doubted my own senses. The station speaker came to life, emitting a "QRZ?" in CW followed by, "Sri OM/lost U/SK."

"Hey," I said, snapping off the station's master power switch and peering around the shack. "Where'd you go?"

"Oi'm roight 'ere," a familiar, high-pitched voice said from behind me. I turned to see a skinny, leggy little figure sitting atop the file cabinet along the rear wall of the room. It was dressed all in green, from the pointed leather slipper to the diminutive derby. The eyes were glaring at me. The facial features were those of a mean old man.

"Ye startled me nairly outta me shoes," the figure said. "Ye'd be Goy, roight?"

"And you've got to be Wee Mac," I acknowledged, mentally apologizing to an EI named Jigger for having thought him demented. "What the hell are you doing here?"

"Plyin' me 'obby," Wee Mac said. "Workin' me rig."

"*Your* rig?"

"*Our* rig, if ye prefer," the little man grinned. "Oi'm willin' to share."

I reached for the creature. He disappeared. I peered around the shack, under the table, behind the computer. Nothing.

"I wouldn't be doin' that agin," the falsetto voice said from behind me. "Next toime ye try to grab me, bucko, it'll be loights out fer ye." My zulu clock rose from the operating table, flew toward my head, missed me by an inch, and smashed against the wall behind me.

"Cut that out!" I yelled. "You can't come in here and take over my shack and tear up my gear!"

"Who says?"

"When I get my hands on you ..."

"Ye get no pot o' gold," the high voice interrupted from another part of the room. "That's blarney. An' ye couldn't be a hangin' on if ye did catch ahold o' me."

My DXCC certificate flew off the wall beside the doorway and sailed toward me, its frame and glass smashing as it hit the floor.

"Hey," I said in anguish. "Please don't tear up the shack any more!"

"Oi'll do ye a deal," said the voice from behind me. I turned to see the little man seated in my chair at the operating table. His head came just to tabletop height. "Ye leave me to work the rig in payce 'til midnight, alone and unbothered, and Oi'll be outta here."

I said, "I must be losing my mind. I can't really be haggling with a ... with a *leprechaun* over use of my *own* equipment!"

"Sure, ye can," said the leprechaun. "How 'bout it, me bucko. A deal?"

I sighed. "A deal. I leave now. You leave at midnight. And you don't come back. Right?"

"Roight. Not 'til next S'n' Paddy's anywoys," said Wee Mac.

I left him there, shut the door behind me, and made my way upstairs. He was gone when I checked next morning. And after a couple of days, I began to believe I dreamed the whole thing.

Then came the notice from the FCC inviting me to explain why my ticket shouldn't be lifted for transgressions committed on March 17 last that included but were not necessarily limited to: (1) operating in that portion of the 20-meter CW band prohibited to General-class licensees; (2) generating keyed continuous-wave signals illegally broadened and distorted by alternating-current modulation and/or lack of proper power-supply filtering; (3) using profane and obscene language in violation of good taste, international treaty, and domestic law; and (4) maliciously interfering with other communications by emitting a hum-modulated, continuous-wave band signal on 14,017,016 hertz for at least 117 consecutive seconds, presumably while tuning up.

"Oh, Lord," I told myself. "Wee Mac's not only cost me my license, but my finals to boot."

He hadn't, as it turned out. I talked my way out of the FCC jam, blaming it on a shack-invading leprechaun. (The harried-looking hearing officer, obviously anxious to get this over with and go home, said there was a lot of that going around, initialed a forgiveness form, and sent me away to sin no

more.) And thank heaven the 6146s are tough little bottles. So for a long time, I thought it was all behind me. But then came the next St. Patrick's Day. And back was Wee Mac.

I knew he was there when I turned into my driveway after work and saw that the beam was pointed south.

I made a lot of noise on my way downstairs so I wouldn't startle him again. He was working sideband when I walked into the shack.

"Hi," I said. "I thought we had a deal."

The little green man held up a hand to silence me. He was standing on the seat of my swivel chair. His waist was level with the operating table in front of him. He bent forward as the speaker went quiet, placed his left palm on the push-to-talk bar in the base of the mike, and leaned on it.

"A foine S'n' Paddy's Day to ye as well," he said into the mike, signed my call, released the PTT switch, and swung around to face me.

"How come you're back?" I demanded.

"Oi loike yer setup," he said. "'Tis one o' the few shacks Oi work where Oi can raych everythin' without strainin' meself."

"How about Jigger's station? Don't you use it anymore?"

"Not after he started kaypin' a snike in it," the little man said. "Can ye imagine any self-respectin' Oirishman kaypin' a snike in his digs?"

"Sure I can," I said, remembering Jigger's comment that he'd gotten rid of his visiting pirate for good. "And a self-respecting third-generation Dutchman like me, as well. I've got a pet snake of my own upstairs, and I'll be moving it down here directly."

"Ye wouldn't!" Wee Mac said, and disappeared.

I haven't seen him since. I lied, of course. I'm no fonder of snakes than St. Patrick himself, but I want Wee Mac to think I've got a great big nasty serpent living beside my rig. I'll find out if he believes it come this March the 17th.

Meanwhile, if you hear an operator with a high-pitched voice or a funny fist with a hum on his signal or a chirp in his note, don't come back to him. It could be just another lid, but it might be a leprechaun. And who needs either one? 73

Transmitting Ferrite Loop for 80/160

Thirty years of experimenting ... now it's your turn!

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Little has been published in the amateur radio press on the subject of ferrite rod transmitting loop antennas. I have been experimenting with these, off and on, for around 30 years.

Here we will look at some earlier background problems, frustrations, and pitfalls first, and then get into a practical 80/160 m design. It is my hope that other amateurs will also experiment along similar lines to produce even better loops, and get some real "on air" activity going. This should more rapidly increase the rate of practical design progress, in a field which heretofore seems to have been mostly limited to defense development and a few commercial activities.

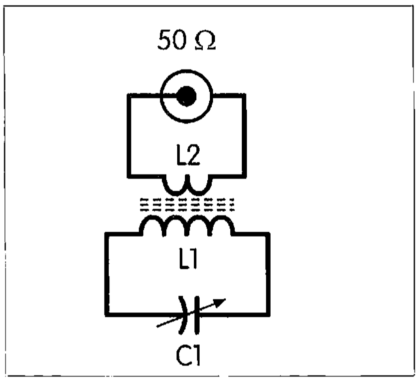


Fig. 1. The conventional ferrite loop. OK "on receive" only.

It was way back around 1960 when I first became interested in the workings of the ferrite rod loop or loopstick. At that time, the usual assembly was an eight-inch-long by three-eighths-inch-diameter ferrite rod, built into a broadcast receiver operating on the medium wave band (and long wave in Europe).

I first wound a coupling coil onto a ferrite loop antenna to enable it to be used as an external antenna coupled to the receiver with coaxial feedline, as in **Fig. 1**. This is now accepted practice.

The next move was to reduce the number of wire turns so that the loop resonated in the 160 and 80 meter bands. The results were encouraging, although progress was slow.

It seemed logical that, using the **Fig. 1** circuit, the process could be reversed—that is, RF fed into the coupling coil via the coaxial feedline—to produce a transmitting loop antenna. My first results were somewhat encouraging, but initial efficiency was very low.

I approached a ferrite rod manufacturer and asked for a quotation for a quantity of six pieces of every eight-inch rod of all available materials, together with materials specifications. The result was a quotation for a minimum order of 5000 pieces in two types of materials—nickel-zinc and magnesium-zinc. Not very helpful!

Later, I inquired as to whether they had any information/experience on the subject of using ferrite rod loops for transmission purposes, or knew where such information might be obtained. The reply was ambiguous (neither yes nor no). In effect, they said they were not prepared to discuss the subject. I took this to indicate that such work was indeed being undertaken, but they could not or would not talk about it.

This only increased my determination to carry on experimenting with ferrite TX loops, with only limited facilities, and without any help or advice from rod manufacturers.

Gradually I gained experience by trial-and-error methods, reaching the conclusion that an effective transmitting ferrite loop antenna could eventually be designed and produced.

In the early 1970s, I moved to Minnesota (USA) to live, work, and operate (G2BZQ/WØ). There, nickel-zinc ferrite rods were readily available, as well as Type 61 material in half-inch-diameter rods. Now I was able to make further progress. The circuit in **Fig. 2** gradually took the place of **Fig. 1**, and I was able to produce a good input-to-output ratio using single rods.

Design challenges for 80 and 160 meters

- Selection of suitable rod materials and dimensions.
- Difficulty of matching/coupling the loop to the TX.
- Core saturation.
- Producing a radiated signal.

Core saturation

When RF is applied to a TX ferrite loop antenna, a point is quickly reached, as power is increased, at which core saturation manifests itself. This is accompanied by a sudden increase in core temperature; a sudden decrease in radiated output signal; and general instability and the production of harmonics, especially the third.

The ferrite rod transmitting loop is essentially a low-power device. Fortunately, this means you can experiment using small-dimension assemblies along the lines of those from the modelmaking hobby, which can be played with in the comfort of your home, irrespective of the weather outside! The basic equipment you need is a field strength meter, a large neon bulb, and a portable receiver.

Ferrite rod selection

Ferrite rods can be divided into two main material groups: manganese-zinc and nickel-zinc. You can obtain each in various "mixes," for different applications. Unfortunately, both types are the same in appearance, so you have to be careful in trying to identify surplus rods.

Experimenting in the 80 and 160 meter bands will teach you that a nickel-zinc rod with an initial permeability of between about 126 μ and 220 μ will be the best. There is every indication that this permeability changes considerably under TX loop conditions. Because we will have to use commercially available rods, our choice will have to be restricted to Amidon Type 61 and MMG Type F14 (with permeabilities of 125 μ and 220 μ, respectively). Manganese-zinc rods (e.g., Types 33 and 43) appear in quantity on the surplus market at attractive prices, but they should be avoided at all costs. They have an initial permeability of maybe 800/850 μ and are quite useless for ferrite loops above VLF and LF.

Experience also has taught me that antenna gain and directivity increase as the rod diameter and/or the rod length is increased. The maximum nickel-zinc rod diameter is one-half inch, with lengths of up to eight inches. You can lengthen rods by adhering two or more of them together, end to end, just as you can increase the diameter by affixing two or more together side by side. The spacing between wire turns, and between wire turns and the ferrite core, is critical.

Some practical TX ferrite loop designs

Over the years I have tried a great many permutations of the ferrite loop antenna for transmitting, with results ranging from quite useless to quite encouraging.

The antenna shown in **Fig. 2** produced some interesting and unexpected results. I experimented with variations of this design in the 1970s and 1980s. The input/output power ratio was my best up to that time.

I started with a simple seven-and-one-half-inch-long by one-half-inch-diameter Type 61 rod, which I later lengthened to 15 inches by cementing two of them end to end. The TX power was gradually increased, and saturation set in at about 18 watts on the 3.5 MHz band using CW.

At 18 watts, the core temperature increased on a thermometer bulb cemented to the rod, and the radiated output (on a field strength meter) suddenly fell off. Up to about 15 watts, no significant harmonics were detected.

Continued on page 16

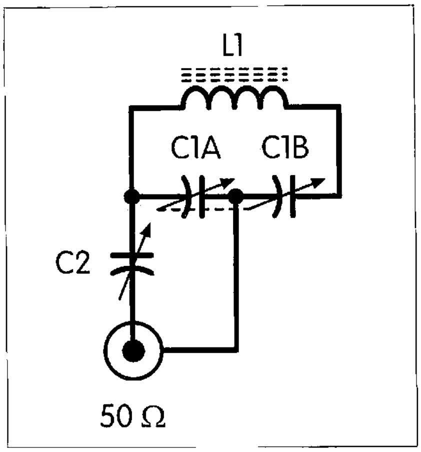


Fig. 2. An earlier TX ferrite loop. Successful, but very difficult to adjust and QSY.

Ferrite Transmitting Loop for 80/160

continued from page 15

Then harmonics appeared as power was increased.

I adhered a second 15-inch rod alongside the first, and rewound LI. This significantly increased the radiated signal, and the saturation point rose to about 22 watts. As an exercise, an electric blower fan was turned onto the L1/rod assembly, and the saturation point was thus increased to about 25 watts. In all cases, interturn spacing, with spacing between wire and core, was used.

I then tried it on the air, using the regular 10/12 watt CW TX, and an occasional QSO was made. The problem was that when QSYing, to answer a CQ call, the loop had to be carefully readjusted to the other station for maximum received signal, and then C1A and C1B and C2 carefully readjusted on transmit. This operation took between one and two minutes, by which time the other station was well into a QSO with someone else.

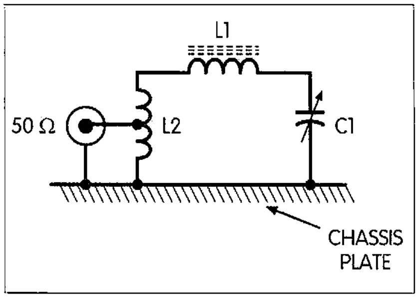


*Fig. 3. A successful TX ferrite loop. Much easier to adjust than **Fig. 2**.*

However, early one morning in January 1987, when the band was quiet, a random CQ was sent at 3560 kHz and a reply received from SMØCOX in Stockholm—an estimated 900 miles! It was not a hoax, as he had often been worked regularly on the normal antenna. A careful check was made to ensure that the 54-inch feedline was not accidentally radiating. The only explanation was that it was a case of two stations being on the right frequency at the right time and on the right day. These results were never repeated.

Later, I scrapped the **Fig. 2** circuit. I used the rods for the **Fig. 3** one. I wound L1 with well-spaced 5 A wire turns, and had it well spaced from the core. LI was resonated by C1, and the coaxial feedline tapped, for 50 ohms impedance, onto air-cored L2. This could perhaps be described as a helical hairpin matching.

This TX ferrite loop was much more docile than the previous one (**Fig. 2**), and relatively quick QSYs could be carried out. With limited operating time between 0430 and 0515 hours, using 10/12 watts CW between 3560 and 3580 kHz, I was able to make some occasional QSOs.

More recently, using my substantial (or at least hard-won) background of practical know-how accumulated over many years, I arrived at the following design.

Ferrite transmitting loop for the 80 and 160 meter bands

This design uses a 12-inch-long by three-quarter-inch-diameter fabricated ferrite rod of either Type 61 or Type F14 material.

The schematic in **Fig. 4** shows L1 suspended above a metal base plate, and resonated by variable capacitor C. The 54 inches of RG-58 coaxial feedline is tapped onto the opposite end of L1, for a Z = 50 ohms match. With the specified turns and construction of the loop, it covers both the 80 and 160 meter bands, although I intended it primarily for 80 m CW. **Fig. 7** shows the general layout built onto a metal baseplate 13 inches long by six

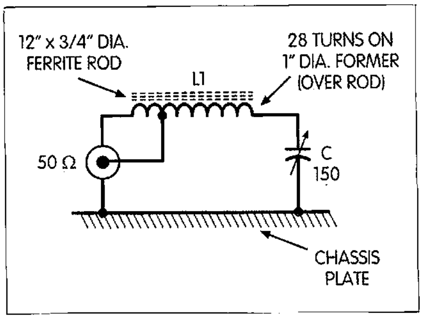


Fig. 4. Schematic of author's 1997 80–160 m ferrite TX loop. L1 = 28 spaced wire turns tapped 2-3/4 turns for Z = 50 ohms. C = 150 pF small, TX-type variable.

inches wide, with an overall height of four and one-quarter inches.

Construction

Fig. 4 shows a 12-inch-long by three-quarter-inch-diameter ferrite rod fabricated from three 12-inch-long by three-eighths-inch-diameter rods (Amidon Type 61 or MGM Type F14) cemented side by side.

Each 12-inch rod is made from two six-inch rods or three four-inch rods, adhered end to end (**Fig. 5A**). You can cut the rods to length with a small hacksaw. The ends of the rods should be lightly cleaned off with very fine abrasive paper, and cemented end to end using cyanoacrylate adhesive, which is very fast-setting.

The three resulting 12-inch rods are adhered together, side by side, effectively producing one solid rod, as in **Fig. 5B**. You must carry out this operation with speed, as it takes only a few seconds for the adhesive to set. Wear a pair of plastic/rubber kitchen gloves to avoid a rod securely glued to a finger, and a trip to the emergency room to separate them!

The format of the 12-inch by three-quarter-inch-diameter rod assists with core cooling, as you can see from the obvious vents shown in **Figs. 5B** and **5C**.

I wound L1 onto a seven-inch-long by one-inch-internal-diameter thinwall cardboard tube (ex-household foil). The wire used was PVC-covered 24/0.2 mm copper with an overall diameter of 2.05 mm and a rating of 6 A at 1000 volts RMS. Any similarly rated

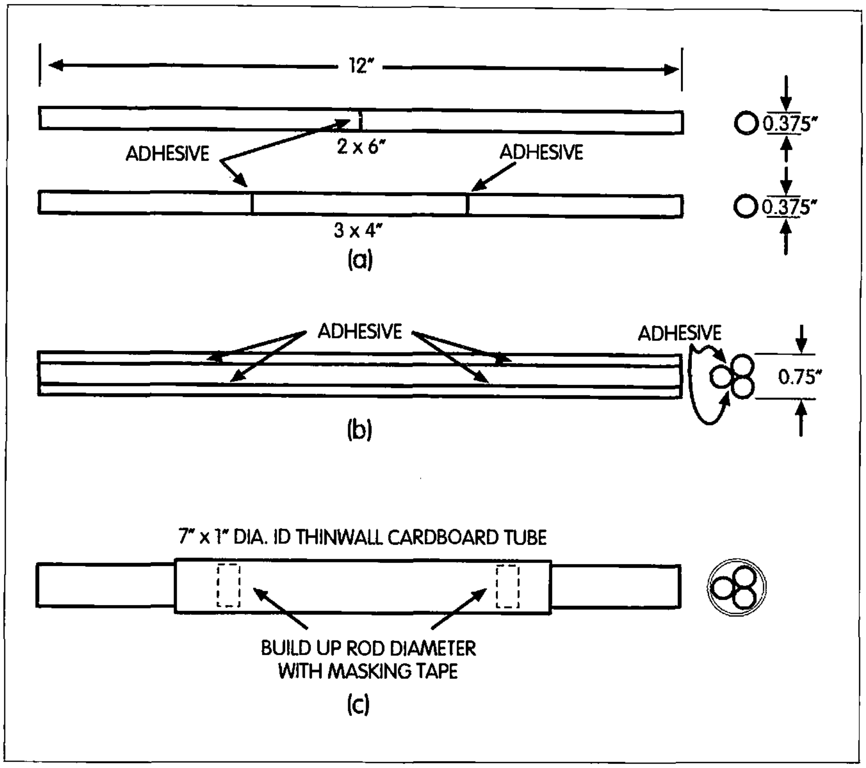


Fig. 5. Assembly of 3/4" ferrite rod and coil former for L1. (A) Fabrication of 12" x 3/8"-diameter rods. (B) Fabrication of 12" x 3/4"-diameter ferrite rod. (C) Assembly of coil L1 former on "B".

PVC-covered wire would no doubt suffice, providing the overall diameter is the same.

The LI winding consists of 28 turns of the above wire, wound counterclockwise, evenly spaced approximately one wire diameter between turns (**Fig. 4**). The right-hand wire drops down to the variable capacitor C (**Figs. 4, 6,** and **7**). The 50-ohm tap is taken from two and three-quarters turns in from the opposite end. Spots of adhesive should hold each turn to the coil tube. The 54 inches of RG-58 coaxial feedline is connected to the tap as shown in **Figs. 6** and **7**.

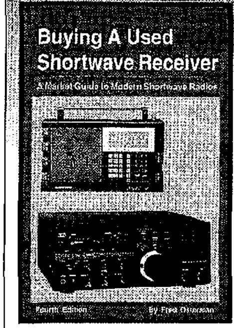
LI is slipped over the center of the ferrite rod as shown in **Fig. 5**. Two bands of masking tape are built up to hold the coil and rod firmly in position (**Fig. 5C**).

The 150 pF variable capacitor should be a widely spaced, larger, well-insulated receiving type, or a small TX type. On the prototype, I used a Jackson type E, with mounting feet.

The whole assembly is mounted on an aluminum base plate 18 inches by six inches (**Figs. 6** and **7**). Two hardwood pieces one-half inch by one-and-three-quarters inches by four and one-half inches high support the L1/ferrite rod assembly. In each a three-quarter-inch-diameter hole is bored for a one-quarter-inch depth as shown.

The right-hand wood support is mounted with base screws and a small bracket, as shown in **Figs. 6** and **7**. You then insert the coil rod end into the three-quarter-inch-diameter bored hole; the left-hand wood support is put over the other rod end; and the outline of the support base is marked, with a pencil, on the baseplate. It can now be fitted to the baseplate with base wood screws, and a small bracket (**Figs. 6** and **7**).

The variable capacitor is secured to the baseplate with base foot brackets or a small metal bracket, depending on the type of variable capacitor used. It should be positioned as shown, so that it is near the coil end. You then fit an insulated extension shaft and a large knob. Secure wiring connections are essential. The RG-58 feedline is connected



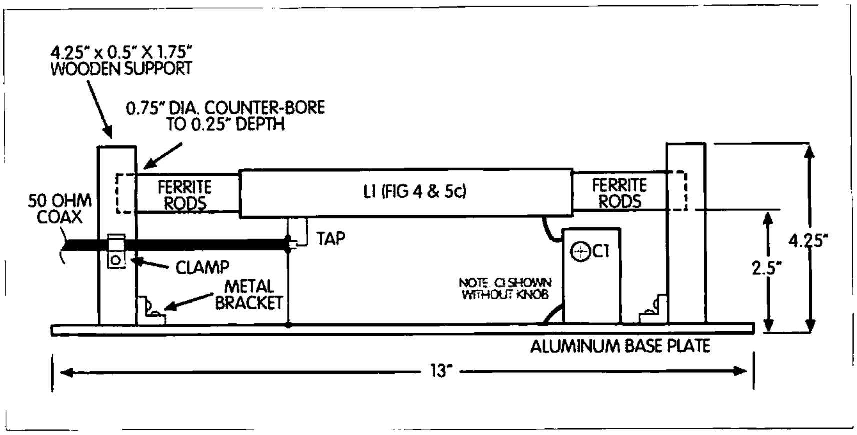


Fig. 6. Assembly, side view.

as shown. The drop down wire, from the coil end, should be rigid 16-gauge tinned copper wire.

Testing and operation

The prototype covered from 1800 kHz to 4000 kHz, with a small overlap at either end. So it covers both the 80-meter and 160-meter bands, though all "on air" tests were between 3550 and 3580 kHz, using CW.

The loop should be connected to the TX and RX combo, with a short length of coaxial feedline. A 54-inch section was used on the prototype, just long enough for the loop to rest on a small table alongside the operating position. Grounding is at the TX/RX, and not at the loop.

The frequency range of the loop should be checked against a calibrated receiver. In the absence of signals at the time, a noise signal can be generated by a pocket electronic calculator placed a short way from the loop. This produces a hash which will peak at the resonant frequency.

For checking with the TX, a field strength meter (FSM) and a large neon bulb are all that are necessary. A useful addition, if available, is a small portable TV nearby, as a back-up check for TVI.

On the prototype, both the RX and TX were tuned to 3560 kHz. The loop was first resonated with the RX. The TX tuned up on a dummy load, and then connected to the loop, and 10/12 watts fed into it. This produced a reading on the FSM placed nearby. Only a minor adjustment was needed on the loop resonating capacitor to peak the FSM reading.

Placing the neon near the loop coil showed, as expected, a high RF voltage at the variable capacitor end—and zero at the feedline end. Note: Take care, because even with 10/12 watts input, you can still experience a nasty RF burn from the variable capacitor (which in an ideal world should be placed in a plastic box).

Using 10/12 watts input, no harmonics could be detected on the FSM, nor TVI on the portable TV.

Using progressively higher power, I found that the core saturation point occurred at around 22 watts. As expected, this was indicated by a dramatic drop in radiated signal indicated on the FSM, and an increase in ferrite core temperature and harmonic radiation (especially the third). This was using CW with key-down.

Reverting to the 10/12 watts input, I found that the TX VFO (at 3560 kHz) could be retuned approximately 12 kHz, without any reduction in the radiated signals on the FSM and thus giving useful instantaneous QSY facilities. Furthermore, a move outside this 12 kHz "bandwidth" required only a quickly executed minor adjustment to the loop tuning capacitor. This removed all the previously described operating difficulties experienced with the circuit in **Fig. 2.**

Remember, it is essential to be able to rotate the directional loop towards the other station, as indicated by maximum signal on the receiver.

On-air activity for me at this QTH is normally limited to 30 to 60 minutes on 80 m CW four or five days per week, terminating with a short regular QSO at about 0510 GMT with a friend in Stuttgart, Germany, maybe about 250 miles distant. On some mornings, in good conditions, I have been able to use this ferrite loop for this QSO.

Conclusions

I hope that some other amateurs will take up my challenge, make up this ferrite TX loop antenna, and then proceed to improve it. I also hope that someone can try it outdoors or in the attic, with remote tuning and rotation facilities.

We all know that it will only be by many more amateurs experimenting with such ferrite transmitting loops that their true potential will ever be realized.

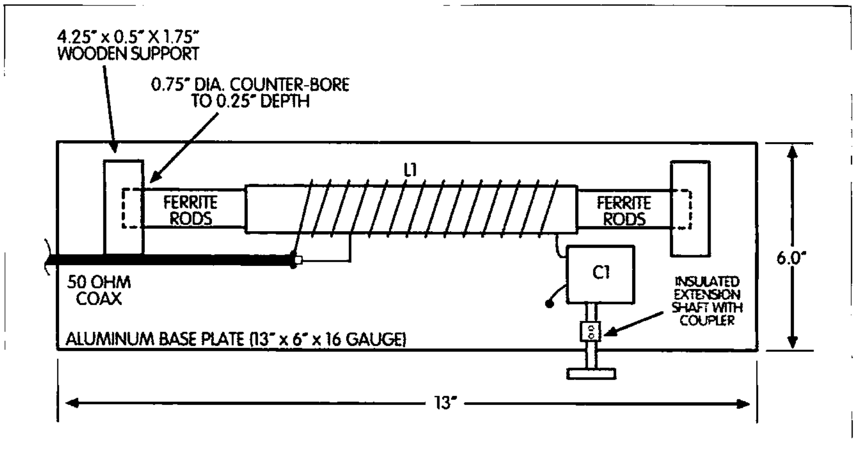


Fig. 7. Assembly, top view.

Ferrite rod suppliers

Type 61 material:
Amidon Inc.
P.O. Box 25867
Santa Ana CA 92799 USA

Type F14 material:
MMG-North America
126 Pennsylvania Avenue
Paterson NJ 07503 USA

MMG-Neosid
Icknield Way West
Letchworth,
Hertfordshire SG6 4AS
England UK

Further reading

"The Fe-One Experimental Compact Transmitting Antenna," Richard Q. Marris G2BZQ. *Practical Wireless,* January 1989.

"An Experimental HF Ferrite Loop Transmitting Antenna," Richard Q. Marris G2BZQ. *Elektor Electronics,* March 1993.

"Experimental Quadraform Ferrite Transmit/Receive Antenna," Richard Q. Marris G2BZQ. *Elektor Electronics.* November 1991.

Magnetics and Ferro-Magnetics Materials. Amidon Inc., April 1995.

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Signals From the Ice: Now That's Really Cool!

Here's what happens when hams meet Alaska's Matanuska Glacier.

John Reisenauer, Jr. KL7JR
P.O. Box 4001
West Richland WA 99353

Few things get my blood racing like portable amateur radio operations in Alaska. I reminded Kent KL5T (ex-NL7VJ) that we hadn't done any HF outings, besides Field Day, for a couple of years. Kent and I are members of the South Central Amateur Radio Club (SCARC) in Anchorage. Kent is the current president; I'd had the privilege in 1993.

When I said, "We should do something unique, like operate from a glacier," I got one of his "you must have been out in the sun too long" looks. I think Kent's memory was still fresh with visions of our last ARRL Sweepstakes contests from the Yukon—when it was 40 below zero (NL7VJ/VY1, 1991 and VY1QST, 1993). Kent said, "We'd better test the gear (he wasn't too excited about my proposed antenna!) and we may as well take my Zodiak™ to give out an island or two at the same time."

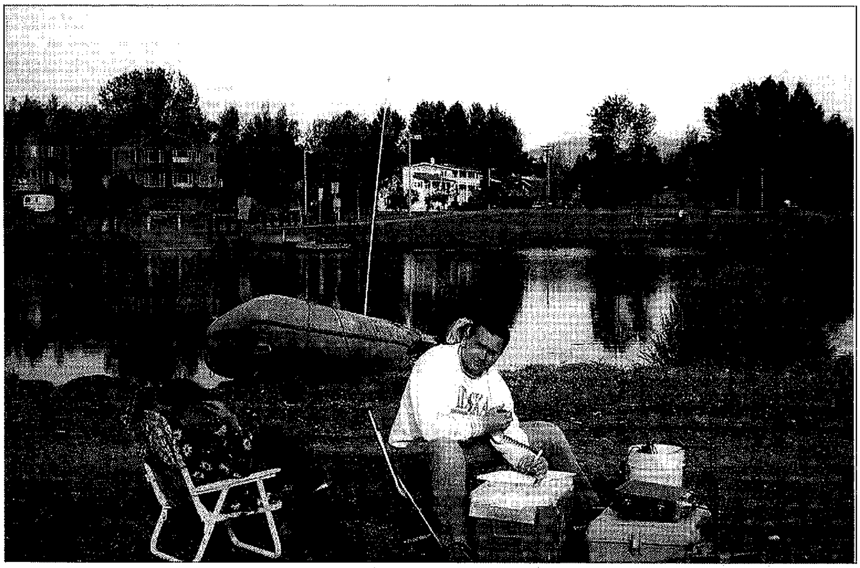

Photo A. KL5T and daughter Kirsten on "practice run" from Kirsten's Island. All photos by KL7JR.

A practice run

It didn't take long to slip the Zodiak (a rugged inflatable boat) into the murky water for Kirsten's Island, in Anchorage, near Cook Inlet. Kent worked on setting up the station, a TS-570D transceiver sitting on a plastic cooler for a table, while his daughter Kirsten helped me assemble a 20-meter vertical antenna made from a length of half-inch copper pipe with a CB whip hose clamped to the tip. Shortly after 0130Z on a beautiful September 9th, 1998, evening, we came on 20 meters as KL5T portable.

Propagation was incredible, as we logged one station after another and exchanged 5/9 reports both ways. The vertical was mounted in a fishing rod holder bolted to the beached Zodiak. We were using Westchester Lagoon for a ground plane. An hour later, with microphone still in hand, Kent suggested we move to another nearby island. Mosquitoes? Hordes of them made operating interesting at times from these

spongelike grass-knoll islands slam full of goose droppings.

Kent, a/k/a "Mr. CW," is having an FB time on phone! Still maintaining our popularity on 20-meter phone, the contacts continued to flow. On battery power, we racked up another 100 Qs all over the US and the following countries: VE, KL7, HK, LU, XE and UA. Kent's Island was also registered for the US Islands Awards (USI) program. Kent was convinced this simple antenna design works DX! On the way home we discussed the glacier outing and who else we could entice to join us.

Journey to the ice

Three days later, I picked up Randy AL7PJ (SCARC treasurer), and we set out for Matanuska Glacier, 100 miles northeast of Anchorage. Kent KL5T had been called out of town by Uncle Sam (he's stationed at Elmendorf AFB in Anchorage) and would miss out on all the fun.

A primitive land lay before us. We gazed across the massive Matanuska Glacier's awesome blue and white ice formations and had an eerie insight into what the Ice Age must have looked like. Ice along the glacier surface melts, meltwater streams are formed. In their search for low ground, these streams carve impressive tunnels and sculptures of all sizes and shapes, throughout the glacier.

The enormous blue river of ice is located one mile off the Glenn Highway in a fertile valley of rushing waterways. Covering an area 27 miles long and four miles wide, this is the largest road-accessible glacier in Alaska; in fact, Randy informed me, a *Star Trek* movie was filmed on Matanuska Glacier a few years ago.

The giant glacier originates from vast mountain ice fields 13,000 feet in elevation in the Chugach mountain range. We couldn't help but wonder how propagation would be with the Chugach Mountains to the south and the Talkeetna Mountains to the north.

It was a drizzling rainy September afternoon when we arrived. The sky was an ominous dark gray, with just a sliver of sunlight poking through, illuminating the glacier, aqua-blue on one side and a pale green on the other. We knew we'd have our work cut out for us, besides the quarter-mile hike to the glacier. The going was slow. We made our own trail, winding around the glacial streams and massive rock boulders deposited as moraine (dirt, rock, and other dragged debris) thousands of years ago by the glacier. We had to trek about a quarter of a mile out over the slippery black ice (young ice, 350 to 500 years old) and climb about 100 feet before we reached the blue ice (old ice, 5,000 to 7,000 years old) where we'd operate.

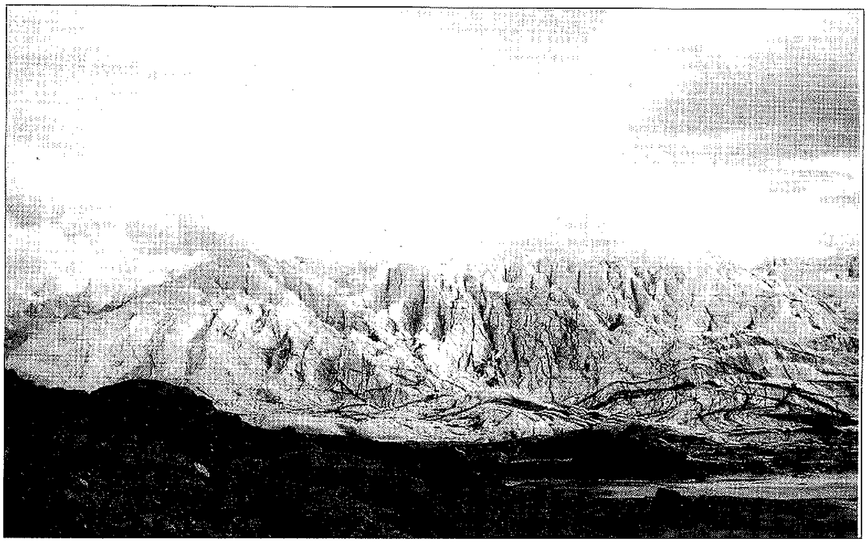

Photo B. *Matanuska Glacier, meltwater streams and terminal moraine.*

Glaciers advance and retreat, depending on the weather and snow accumulation as they grind their way over the land. Glacier trekking is dangerous and should never be attempted alone or without proper safety gear. The basic safety gear should be crampons, ropes, ice axes, and a survival kit of some sort. While Randy and I are not novice glacier hikers, we didn't venture far onto the ice either.

Crevasses (deep cracks in a glacier) infested the face of Matanuska Glacier. Some glacier crevasses are large enough to accommodate a 10-story building or easily hide a downed aircraft! A few times we stopped to listen to the hollow lowing sounds emanating from the groaning, creaking ice beneath us.

After finding something of a level spot on the ice, we immediately put the station together. While Randy was hooking up the radio, I mounted the copper pipe antenna to a wooden stand anchored with rocks (moraine). Four quarter-wave-long ground radials were spread out on the ice to complete the installation. Much to our surprise, the rain had stopped—but black storm clouds were moving in. We were now ready to battle the mountains and approaching storm.

Cool DXing with K7ICE and KL7Glacier

Randy started off using K7ICE, the club call of the North Country DX Association, which was chartered to promote amateur radio in the north. Conditions on 20 meters were terrible, compared with a few nights earlier from the islands. Contest QRM ruled and most signals were weak. It took an hour to make the first contact.

After a few more hard-earned QSOs, Randy called Jim KL7CC in Anchorage on his cell phone to listen for us on 20 meters. How's that for ingenuity? We barely heard Jim, and he had no copy on us. Next, Randy called Del KL7HF, who spotted us on packet as "K7ICE/KL7 on Matanuska Glacier." That helped. Calls from W6 and W7 started to come in. We also enjoyed a short opening to W1-W3.

Packet radio again proved to be a valuable asset. An Oregon ham replied, "K7ICE is camped on a glacier—now

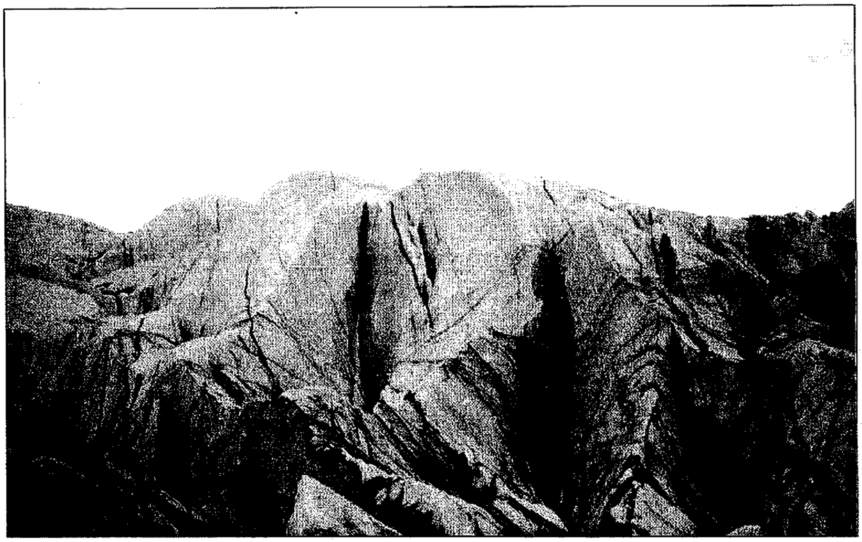

Photo C. Crevasses on Matanuska's face.

Photo D. AL7PJ operating as K7ICE/ Matanuska Glacier.

that's really cool!" We thought so, too. The most-often asked questions about our expedition were "Why are you there?" and "Why are glaciers blue?"

Well, Randy and I shook our heads about the first question and replied "because operating HF from an Alaskan glacier was probably a first for amateur radio, if not a first for us, and we thought that warranted our efforts."

As for the second question, I read aloud a paragraph from a brochure obtained from the Matanuska Glacier Lodge which went into detail in explaining why glaciers appear blue in color. I had known that question was sure to pop up. For those who want to know, here it is: Glaciers are blue because the ice crystals are extremely dense. After many centuries of pressure, hardly any cracks or air bubbles are present to reflect light. The old (compressed) ice crystals reflect only the short blue wavelengths of light and absorb wavelengths of other colors. The older the ice, the bluer it appears, especially on overcast days.

We weren't working any stations outside North America, so we relocated our station to a higher spot on the ice and switched to SCARC's club call, KL7Glacier. Band conditions were improving. We were visited by other glacier hikers who were curious about the noise we were making and our antenna. One guy said, "You must be taking sonar readings of the ice or something." He commented "Far out," when we told him we had just talked to Italy and that we were bouncing HF signals off the ice.

IU2P said, "Working a glacier is a first for me." K6JOX commented, "You're on packet as DXing from a glacier in Alaska—bet you're having an adventure."

Just when we thought we were the only hams around for probably a hundred-mile radius, we were floored when this stranger, out of the blue, asked, "How's propagation on 20 meters, guys?" We turned around and eyeballed with W5EGF, who said he was vacationing in the area. He also told us he'd had that call since he was eight years old!

If that wasn't bizarre enough, I finally made contact with Leif JW2PA, on Spitzbergen Island, who said he had visited Matanuska Glacier just two weeks before. Leif was surprised to learn we'd been calling him for an hour when he gave us a 5/7 report. We had a nice rag-chew about his Alaska trip. I told Leif that if he was on E-mail, we'd send him photos of our glacier operations. Randy brought his digital camera and naturally I had two 35 mm cameras along. Many signals were 5/9 now.

After four hours on the glacier, a cold wind picked up, making operating highly uncomfortable. We decided to call it a day. We hadn't done too badly, working six countries and having an exciting adventure, too! Shortly after we arrived back in Anchorage, Randy E-mailed the photos of our ice station to Leif and me. It's amazing what you can do with amateur radio—and from where!—in the great state of Alaska!

I'd like to thank all who contacted us, especially other SCARC members; Jim KL7CC, for the use of his TS-570D; TJ KL7TS, for the tools and hardware; Kent KL5T, for the gel cells, coax and island operation; Del KL7HF, for the packet radio spots; and Randy AL7PJ, for teaming up with me. The North continues to call me. Those who understand are shaking their heads in silent understanding. But for now, from mosquito-infested islands to bone-chilling blue ice, another fun-filled amateur radio adventure "up here" is history.

Anti-Metric?

You already use it more than you think!

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The United States has been in the process of converting to the metric system (called *metrication*) for over 20 years. In the mid-1970s, most British Commonwealth countries made the metric transition, leaving the United States in the company of other officially nonmetric countries such as Liberia and Myanmar (Burma). In fact, the US is the *only* industrialized nation not predominantly using metric. Even Britain is largely metric, but still uses miles on road signs and pints for beer. Closer links to the European Union have caused Britain to adopt metric much faster than the US.

So why are we not metric?

The reason we are not metric is a combination of limited opposition and a much larger portion of apathy. The fact that metric is not the "native" measurement system for most Americans breeds resistance. Some people refuse to change, mainly out of fear of the unknown. But that fear can be overcome with a better understanding of the simplicity of the metric system, a system that is much easier to use than our existing hodgepodge of units.

The apathy part comes from those who may know the benefits of metric measurement, but are unwilling to take steps toward that goal. They want someone else to change first. In this article we'll see how many products and services are already metric or have changed to metric in recent years. Because of these, we are more familiar with metric units than we may realize.

When most of us encounter metric units, it's often through conversion factors between inch-pound and metric units. Conversion factors, such as 3.28 feet per meter, only serve to cloud the simplicity of the metric system, where conversions between units use factors of 10. Dual units, however, are only a temporary inconvenience, since if we were fully metric, we would not be converting between metric and inch-pound units and would not encounter such odd conversions. This is a major advantage of having one unit system throughout the world.

The benefits of the metric system

The metric system is a decimal system, like our monetary system. In fact, the US pioneered decimal coinage in 1786. All other currencies in the world are now decimal. In Great Britain, the former system consisting of pounds sterling, shillings, pence, and farthings was abandoned in 1971. Now the British use a pound unit of currency that is divided into 100 pence. In the late 1960s and early 1970s all other countries using the former British system changed to decimal currencies as well, leaving behind the days of nondecimal monetary systems. The last country, Nigeria, changed in 1973.

In 1996, the Canadian Stock Exchange was decimalized, and the US stock exchanges are finally going decimal soon after the year 2000. As an intermediate step toward that goal, stock prices are now quoted in sixteenths, or 6.25 cent increments, down from eighths, or 12.5 cents. The switch to decimal trading will bring the US in line with the rest of the world's major exchanges.

Some people may argue the benefits of base 2 (binary) and base 12 (duodecimal) systems for measurement, as opposed to decimal. However, neither of these matches the world's existing decimal counting system, and would thereby suffer a major disadvantage if

used with decimal coinage and decimal measurement systems.

The metric system is more universal and international than the common units most Americans use. And we know well that amateur radio is an international hobby. Far more people use metric than not. When we talk on the air to anyone outside the US, do we expect them to understand our measurements in miles, feet, and inches, or our temperatures in degrees Fahrenheit?

In fact, the US is the only industrialized nation that still uses Fahrenheit in weather reports for surface temperatures. Upper air temperatures have always been measured and reported in degrees Celsius worldwide. And, as of July 1996, the international standard code for hourly and special surface weather observations (METAR) now uses degrees Celsius for the temperature and dewpoint fields.

The metric system is based on the idea of one base unit for all similar types of measurements, such as the meter for length. The meter can be subdivided into decimal parts by using prefixes, arriving at centimeters, millimeters, and micrometers. Or the kilo prefix can be applied to arrive at kilometers for larger distances. These units are factors of 10, 100, or 1000 different, and lengths can be converted in scale merely by moving the decimal marker. No need for numerous units for length such as inches, feet, yards, rods, and (statute and nautical) miles, where the conversion factors between units are all different. The units we use are not as well known as some people claim they are. Quick, what's the definition of an acre?

Most Americans do not realize that the metric system was made legal for all purposes in the US in 1866. Then, in 1893 our common inch-pound units were first defined and standardized in terms of metric units, which are regarded as the fundamental and internationally-accepted standards of length, mass, etc. Much later, in 1958, the definition of the inch was finally standardized *worldwide* as 25.4 millimeters exactly. Previously the definition of the inch varied among the major inch-using countries: the US, Great Britain, and Canada. The difference was enough to cause confusion, inefficiencies, and difficulties during World War II in attempts to interchange various precision products.

The pound and the gallon are also defined in terms of metric units (the kilogram and the liter) by US law, but to a larger number of significant figures than the inch. Before the metric system came along, there were numerous standards for most inch-pound units. These units varied greatly in some cases, causing problems in daily commerce. This problem still exists for some units, such as the foot, where the international foot (based on the standard 25.4 mm inch) and the survey foot (based on an older definition of the inch used by the US, which differs by 2 parts in 10^6) are both still in wide use.

This leaves us with two definitions of the mile, one based on the international foot and the other based on the survey foot. Although this may not seem like a big difference, it causes the two definitions of a mile to differ by about one-eighth of an inch, or 100 miles to differ by over one foot!

How we already use the metric system

Don't think that the metric system is strange. We use metric units in many ways now—possibly in many more ways than we realize.

The electrical units we currently use are part of the metric system. The ampere is a base unit in SI (the International System of Units). Other electrical units such as volt, watt, joule, ohm, farad, and henry are all derived metric units (combinations of base and/or other derived units).

Amateurs also use meters, centimeters, and millimeters for wavelengths. We have frequency allocations on the 160 meter through 23 centimeter bands. For higher frequencies we generally speak in terms of megahertz and gigahertz frequencies, which are metric units for multiples of cycles per second.

When building a dipole antenna, why struggle with the formula in feet? When using the formula in meters, the half-wave antenna length relates nicely to the radio wavelength. For example, on the 20 meter band, the half-wavelength is approximately 10 meters long, a more logical solution than converted to 33 feet. And for a vertical ground-plane antenna, the length is approximately one-quarter of the radio wavelength. For the 10 meter band, the quarter-wave antenna length is approximately two and a half meters,

You Be the Judge
(answers at bottom)

Question A: Which column would you rather add?
(The two sums are the same.)

1 yard 2 feet 3-1/4 inches
1 foot 11-3/16 inches
2 feet 5-1/2 inches
3 yards 1 foot 6-5/8 inches

1.607 meters
0.589 meters
0.749 meters
3.216 meters

Question B: A room measures 15 feet, 3-3/4 inches by 21 feet, 7-1/2 inches (4.667 m by 6.591 m). What is its floor area in square yards?
What is its floor area in square meters?

Question C: In designing a calendar, you wish to divide an area of 7-1/4 inches by 11 inches (184 mm by 279 mm) into 35 rectangles (that is, you wish to divide 7-1/4 inches by 5 and to divide 11 inches by 7). What are the dimensions of each rectangle in inches? What are the dimensions of each rectangle in millimeters?

Answer A: 6 yards, 2 feet, 2-9/16 inches, or 6.161 meters
Answer B: 36.79 square yards, or 30.76 square meters
Answer C: 1-29/64 inches by 1-37/64 inches, or 36.8 millimeters by 39.9 millimeters

again more logically related to the wavelength than when converted to eight feet.

Amateurs use kilograms for satellite mass (weight) and kilometers for satellite orbits. Kilometers are also used for best terrestrial distances for VHF, UHF, and microwave contacts—and how about low-noise amplifiers used for satellite reception? Such receivers are rated by temperatures in kelvins, an SI unit equal in size to the degree Celsius (the metric scale used for everyday temperatures), but on a scale with the zero point at absolute zero of temperature rather than at the freezing/melting point of water.

Surface mount chips are making the transition away from inch-based pin spacings to millimeter-based contact spacings. And many new electronic connectors use millimeter pin spacings.

Look at many other examples of metric usage that surround us:

In photography, we have 28-, 35-, and 70-millimeter (IMAX) width film. Lens and filter sizes are given in millimeters, as are eyeglass lenses and glasses frames. Stamps and stamp collecting supplies are measured in millimeters. Almost all pharmaceuticals and vitamins come in grams, milligrams, and micrograms. Many cosmetic containers are in rounded metric sizes. Most garden seeds are packaged in grams or milligrams. All food packages are required to have the net weight statement in both metric and non-metric units, and an increasing number of them are coming in rounded metric sizes. Nutrition fact labels on food packages show the mass of fat and other constituents in grams. Liquor and wine are bottled and sold in milliliters and liters exclusively.

Nearly all automobiles, trucks, motorcycles, and bicycles are now built using metric standards and components. The same is true for farm and construction equipment. Skis and snowboards are measured in centimeters, and soaring and sail planes use metric measurements for most applications. Olympic events are measured in metric units. Running race distances are mostly in kilometers, as are cross-country ski trails, rowing events, and most track and field events.

Those 3-1/2-inch computer diskettes are actually 90 millimeters in diameter, and compact videotapes are eight millimeters wide. CDs and DVDs have metric diameters as well. Light bulb power is measured in watts and light output in lumens. Mechanical pencil lead comes in 0.5 and 0.7 millimeter widths. Wallpaper often comes in five- and 10-meter lengths and metric widths. Construction adhesive and caulk are now packaged in 300 milliliter tubes. Several brands of dental floss come in metric (50 m and 100 m) lengths, as do all cigarettes. Luggage weight for international flights is measured in kilograms. And you thought metric units were only used outside the US! (Oh ... and don't forget your metric tool set!)

The metric system is not dead in America. After our initial steps toward metric in the 1970s, there has been some delay, but progress is currently being made in the areas of federally-funded road and building construction. The US is considering allowing metric-only labels on products to accommodate the export of those products to Europe, whereas dual labeling is presently required on all consumer products in the US.

Arguments for converting

Often we don't realize how much more difficult we make simple arithmetic problems by *not* using metric units. Our educational system spends numerous hours teaching our collection of units, fractions, and the conversion factors we need with these units. How many needless conversions are required to solve a problem like: There is a container four feet 11-13/16 inches tall, five feet 5-3/4 inches wide, and eight feet 3-3/8 inches long. How many gallons does it hold?

Or try this one: There is a field one mile 64 chains two rods three feet three inches by two miles 50 chains one rod two feet five inches. How big is the field in acres? Or how big is the field in square feet? Many of us do not even know the definition of a chain or a rod!

It is much simpler to solve these problems using the metric system, rather than with our nondecimal inch-pound units.

Also, *what if* we were already a metric country and people understood it, and *then* someone suggested that we change to new-fangled inch-pound units. That is when people would say: "What! You mean we should adopt a system where the ratios between the units are 12, 3, 1760, and 5280 for common lengths alone?!" Or: "You mean we need to use fractions!" Or even: "You mean we should measure temperature and put the freezing point of water at 32, and put the zero point at a place that has little or no meaning?" They would also say that this or that new unit is too small or too large, a common argument when converting to metric. Most people would think that such a proposal to change away from the metric system to a less logical system was absurd, and it is, because we don't see any countries doing that.

For more information

The metric system has been around since the late 1700s and in its modern SI form since 1960. Yet some Americans may not realize that most of the world uses metric. That's partly because our news media conveniently convert measurements in the foreign news, shielding us from metric usage that is prevalent in the world. Anyone who travels outside the US soon realizes that our nonmetric units are not used in other countries. On the other hand, much of the world either speaks or understands our English language, a trend that cannot be denied. Would it not be much simpler if the whole world spoke one language (but that's another story) and used one measurement system (metric)?

Many details on the metric system and its proper use are not included in this article. The US Metric Association (USMA) maintains a Web site which contains a wealth of information on the metric system, references to metric standards documents, as well as current information on the status of the metrication in the US. The URL is: [http://lamar.colostate.edu/~hillger/] or [http://www.metric.org].

The USMA also publishes a bimonthly newsletter titled *Metric Today*.

Everyman's Guide to Active Filter Design

Now you know.

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Filters? Who needs filters? The answer is, everybody needs filters! Or at least every *radio* needs them! Electronic filters serve to pass signals within a desired band of frequencies, and reject signals lying outside this range. The most basic crystal radio contains at least one filter, and today's modern transceivers contain dozens.

The ability to design filters for a given custom application is a valuable skill for the home-brew hobbyist. Good audio filtering on both the transmit and receive of your rig can really make a difference in the intelligibility of your signals. However, filter design is a topic not thoroughly covered in *The ARRL Handbook*, nor, for that matter, in many electrical engineering curricula. Designing any filter based on an existing circuit is a math-intensive process which is frightening enough, but to design a filter from scratch usually requires circuit optimization computer software which most hams will not have available. So what are we to do?

Luckily, the hard mathematical work involved in filter design has already been done for us. In the early days of digital computers, it was recognized that standard tables of filter components would be extremely valuable for those engineers not wanting to derive these quantities for themselves. So, authors such as Blinchikov, Zverev, *et al.*, have compiled wonderful books containing design information covering every conceivable filter you could imagine.

Texts such as these contain tables of component values allowing the designer to construct filters consisting of inductors, capacitors, and resistors. The filter designer will discover, to his dismay, that the large-valued inductors required to construct a filter operating on signals in the audio frequency range are *not* stocked at the local Radio Shack[3]—nor anywhere else! This is where active filters are so valuable, as they allow the construction of filter networks composed of resistors, capacitors, op amps, and *no* inductors.

Since it has not always been easy to come by information on how to convert a passive filter design, such as those contained in the filter design handbooks, to a more easily constructed active filter, I have had to figure much of this out for myself. I now have quite a bag of tricks allowing me to design an active filter, quickly, of nearly any topology I might select. Looking back at how much time this information could have saved me years ago before I derived it, I am now sharing this so that others may benefit.

Background

There is a certain vocabulary of terms used to describe filters, and it is useful to become familiar with them. A given filter has a *passband*, that range of frequencies it is designed to pass, and a *stopband*, that range of frequencies it is intended to attenuate. The *frequency response* of a filter is its ratio of output to input voltage versus frequency. The frequency at which a filter's output power is one-half that at the center of the passband is regarded as the point of transition between the passband and stopband, and is referred to the *-3 dB frequency*.

There are a number of different types of filters for different applications. The *low-pass* filter serves to pass signals below a given frequency, and block those above this. A *high-pass* filter, conversely, blocks low-frequency signals, and passes high-frequency ones. A *band-pass* filter passes only those signals lying between

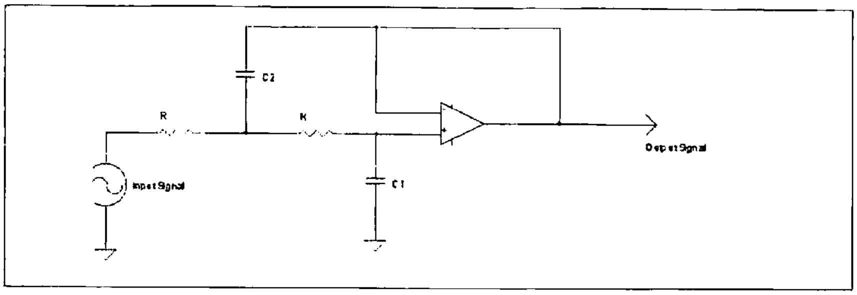

Fig. 1. Two-pole Sallen-Key low-pass filter.

two frequencies, while a *band-reject* filter serves to notch out those signals lying in a certain range.

Additionally, filters are further defined by the shape of their passband frequency response curves. A filter having the flattest possible frequency response within its passband is called a Butterworth filter. This is the most common type encountered in electronics design. A filter with the steepest possible transition between the passband and the stopband is called a Chebychev filter. However, this improvement comes at a price—the Chebychev filter exhibits ripple in its passband frequency response. The amplitude of the passband ripple of a given Chebychev filter, in dB, is used to describe it. A Bessel filter possesses a gradual roll-off of frequency response between passband and stopband. The Bessel filter frequency response is optimized for its time-domain response—which is to say that it does not "ring" in the manner of other filter shapes, such as the Butterworth and Chebychev. Consequently, the best CW filters are of the Bessel type.

The amount of attenuation a filter provides within the stopband is a function of the number of inductors and capacitors it contains. For a simple low-pass or high-pass filter, the total number of reactive components (Ls or Cs) is the number of *poles* the filter contains. For a low-pass filter, the increase in attenuation for each octave of frequency increase in its stopband is 6 dB times the number of poles. In other words, a one-pole filter cuts the voltage of the signal passed in half each time its frequency is doubled. A three-pole filter cuts the signal voltage to one-eighth with each doubling of frequency, etc. Consequently, the higher the number of poles a filter possesses, the higher the rate of attenuation within the stopband.

The filter design information contained in the filter handbooks is generally in a *normalized* format. These tables contain the values for capacitors and inductors for low-pass filters fed from a one ohm impedance source, terminated in one ohm at the output, and with a -3 dB point of $1/2\pi$ Hz. This information is given for Bessel, Chebychev, and Butterworth filter shapes containing any given number of capacitors and inductors. From this normalized information, it is possible to derive component values for passive filters of any -3 dB frequency, whether

Continued on page 28

SHAPE	R_{input}	X_1	X_2	R_{output}
Butterworth	0	1.414	0.707	1.0
	1.0	1.414	1.414	1.0
0.1 dB Chebychev	0	1.404	0.829	1.0
0.3 dB Chebychev	0	1.383	0.935	1.0
1.0 dB Chebychev	0	1.301	1.195	1.0
3.0 dB Chebychev	0	1.063	1.819	1.0

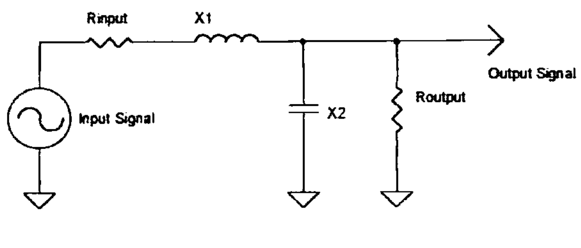

Table 1. Normalized filter coefficients for two-pole filters.

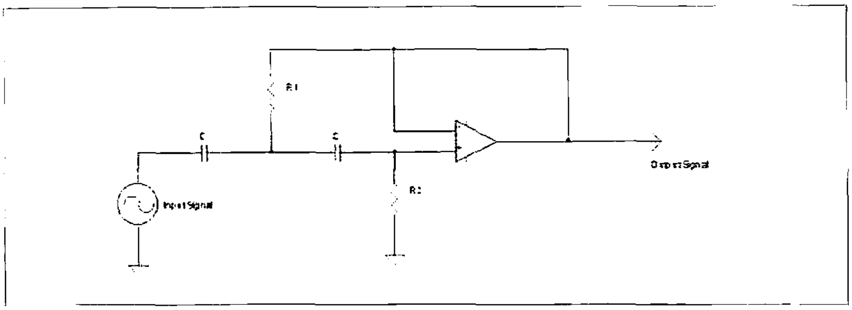

Fig. 2. Two-pole Sallen-Key high-pass filter.

Everyman's Guide to Active Filter Design

continued from page 27

of low-pass, high-pass, band-pass or band-stop types.

I have included **Tables 1** through **4**, which contain normalized low-pass filter component values for filters containing two through five total capacitors and inductors, in frequency responses having Bessel, Butterworth, 0.1, 0.3, 1.0, and 3.0 dB passband ripple Chebychev curves. (Notice that for the two- and four-pole filters, values are listed for an input impedance of *zero* ohms. This is because, for mathematical reasons, even-numbered-pole Chebychev filter responses cannot be attained with equally-terminated filters.)

So much for theory! Are we ready to do some real designing?

The most common type of active filter is depicted in **Fig. 1**. It is a two-pole low-pass type, with two resistors, two capacitors, and an op amp. This very simple, easy-to-design circuit is referred to as a "Sallen-Key" filter, after its inventors. To convert from the normalized, low-pass values of **Table 1** to an actual working filter, we select the shape of the filter desired (Butterworth, Chebychev, or Bessel) using the singly-terminated values. After selecting the value of the -3 dB cutoff frequency, f_{-3dB}, the value of capacitor C_1 is given by:

$$C_1 = \frac{X_1}{4\pi \cdot R \cdot f_{-3dB}}$$

and the value of C_2 is given by:

$$C_2 = \frac{X_2}{\pi \cdot R \cdot f_{-3dB}}$$

Let's try designing a 3 kHz, Butterworth low-pass filter, such as might be used in an SSB receiver circuit. From **Table 1**, we see that the normalized value for X_1 is 1.414, and the value for X_2 is 0.707. With a little algebraic manipulation of the equations above, we obtain:

$$\frac{C_1}{C_2} = \frac{X_1}{4 \cdot X_2}$$

Thus, we see that for these values of X_1 and X_2, $C_1 \div C_2 = 1/2$. Approximating this ratio using common junk box values of 0.001 µF and 0.0022 µF for C_1 and C_2 respectively, we can work back to obtain R:

$$R = \frac{X_1}{4\pi \cdot C_1 \cdot f_{-3dB}} =$$

$$\frac{1.414}{12.6 \cdot 10^{-9}\ \mathrm{F} \cdot 3000\ \mathrm{Hz}} = 37.4\ \mathrm{k\Omega}$$

This is not a standard resistor value, but we may use the next closest, 36 kΩ, which is less than 4% off.

That was easy enough! With these formulas and a calculator, anyone can design a low-pass filter. Now, how about a high-pass filter? Just as easy! For the Sallen-Key topology, a low-pass filter can be transformed into a high-pass filter simply by exchanging the resistors and capacitors. The same formulas hold true—just exchange the Rs and Cs! See **Fig. 2**:

$$R_1 = \frac{X_1}{4\pi \cdot C \cdot f_{-3dB}}$$

and

$$R_2 = \frac{X_2}{\pi \cdot C \cdot f_{-3dB}}$$

Let's try designing a 300 Hz, two-pole Butterworth high-pass filter. If we pick C = 0.01 µF, then from the equations immediately above, R_1 = 37.4 kΩ, and R_2 = 75.0 kΩ.

The Sallen-Key active filter circuit is widely used for two-pole filter implementation. If, however, a filter with more than two poles is required, the design procedure for a Sallen-Key circuit implementation becomes much more difficult. Therefore, other circuit

SHAPE	R_{input}	X_1	X_2	X_3	R_{output}
Bessel	1.0	1.557	1.027	0.511	1.0
Butterworth	1.0	1.0	2.0	1.0	1.0
0.1 dB Chebychev	1.0	1.435	1.594	1.435	1.0
0.15 dB Chebychev	1.0	1.523	1.523	1.523	1.0
0.3 dB Chebychev	1.0	1.686	1.400	1.686	1.0
1.0 dB Chebychev	1.0	2.217	1.090	2.217	1.0
3.0 dB Chebychev	1.0	3.352	0.713	3.352	1.0

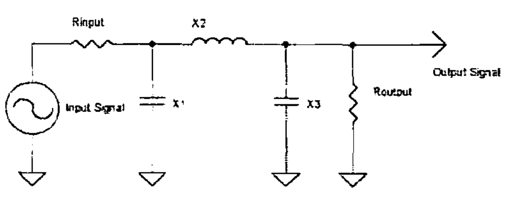

Table 2. Normalized filter coefficients for three-pole filters.

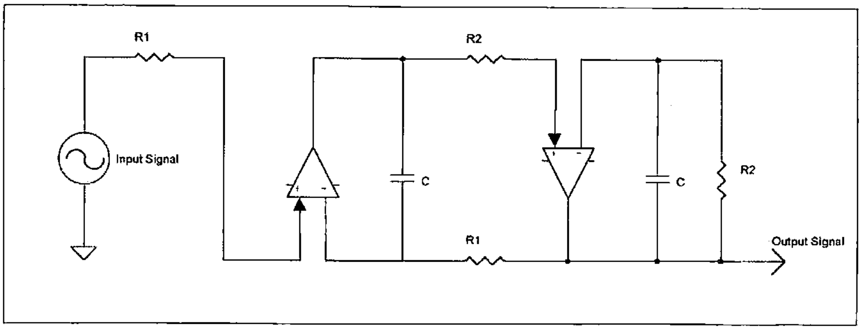

Fig. 3. Two-pole low-pass filter using Norton op amps in leapfrog topology.

topologies can be considered for these higher-order filters.

At this point, an introduction to a very useful op amp is appropriate. This is the Norton op amp, of which the type LM3900 is the most commonly used example. Whereas conventional op amps amplify the difference in voltage applied to their inputs, the Norton amplifier amplifies the difference in current applied to the input pins. The input pins of a Norton op amp have low impedance to ground, and so can be considered current sinks—the only caveat being that the input currents cannot be negative. Further, the LM3900 Norton op amp is designed to operate from a single supply voltage, so it is well suited for application in portable, 12-volt-operated equipment.

Fig. 3 depicts the Norton op amp configured in a two-pole low-pass filter constructed in what is referred to as a *leapfrog* topology. Here, each capacitor or inductor in the passive filter prototype circuit is replaced by an op amp, a capacitor, and two (or three) resistors. The beauty of the leapfrog filter topology is that the formulas for calculating component values are very straightforward, allowing anyone with a hand calculator and filter tables to design a high-order active filter. While leapfrog filters can be constructed using conventional op amps, to implement a given filter it requires 50% more op amps and resistors than with Norton op amps. So for this discussion, we shall use Norton amplifiers.

We can now use this basic circuit to derive a series of equations to allow the design of an active filter. Selecting normalized filter values from **Table 1, 2, 3,** or **4** and cutoff frequency, f_{-3dB}, we then select a capacitor value for use throughout the filter.

Unlike resistors, high-precision capacitors are not always easily available. However, capacitors of the same value, from the same manufacturing run, are usually matched in value unit-to-unit better than the stated tolerance, and so can be used to obtain the necessary precision.

We refer to **Fig. 3.** The first op amp models the action of the first inductor in the passive low-pass circuit. The value of R_1 is defined as:

SHAPE	R_{input}	X_1	X_2	X_3	X_4	R_{output}
Bessel	0	1.540	1.114	0.855	0.400	1.0
	1.0	1.736	1.629	0.780	0.613	1.0
Butterworth	0	1.532	1.581	1.087	0.389	1.0
	1.0	0.766	1.850	1.850	0.766	1.0
0.1 dB Chebychev	0	1.516	1.776	1.461	0.675	1.0
0.2 dB Chebychev	0	1.503	1.819	1.503	0.706	1.0
0.3 dB Chebychev	0	1.485	1.853	1.527	0.822	1.0
1.0 dB Chebychev	0	1.377	2.053	1.519	1.129	1.0
3.0 dB Chebychev	0	1.102	2.635	1.281	1.793	1.0

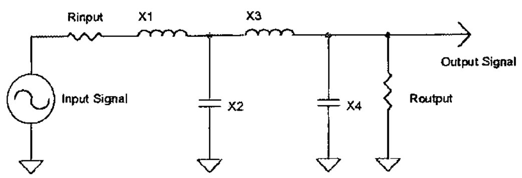

Table 3. Normalized filter coefficients for four-pole filters.

$$R_1 = \frac{X_1}{2\pi \cdot C \cdot f_{-3dB}}$$

If the filter is doubly terminated (i.e., having a resistor at the input), this first capacitor is paralleled by a resistor equal to R_1.

The second section of the filter mimics the action of the capacitor and resistor at the filter output. The value of resistor R_2 used in this section is given by:

$$R_2 = \frac{X_2}{2\pi \cdot C \cdot f_{-3dB}}$$

At this point check to see that these values are realistic—try to keep any values of R between 33 kΩ and 3.3 MΩ for best filter performance using the LM3900. If not, adjust the value of C accordingly, and try again.

This same technique can be extended to filters containing any number of poles. For a filter with more than two poles, we simply cascade successive sections, as is shown in

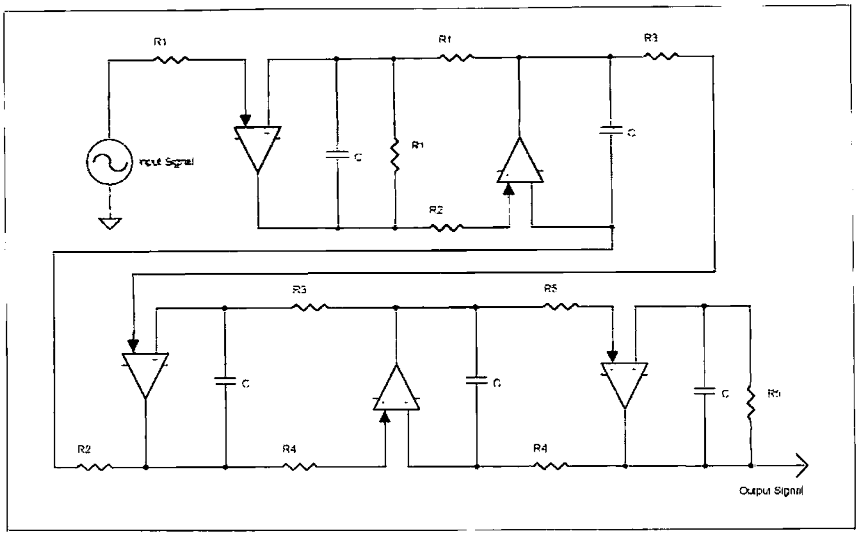

Fig. 4. Five-pole low-pass filter using leapfrog topology.

Fig. 4. Let's try a more complicated example: a five-pole low-pass filter having a 0.21-dB-ripple Chebychev response, and a 3 kHz cut-off frequency. Let us also pick C to equal 0.0022 µF. From **Table 4**, we see that the five-pole, 0.21-dB-ripple Chebychev has the unique property that four of the five component values in the normalized filter are the same. This makes the design procedure very easy, as we only need to calculate two component values!

Using our very first preceding equation to calculate R_1, R_2, R_4, and R_5:

$$R_1 = R_2 = R_4 = R_5 = \frac{X_1}{2\pi \cdot C \cdot f_{-3dB}} =$$

$$\frac{1.475}{6.28 \cdot 2.2 \cdot 10^{-9} \cdot 3\text{ kHz}} = 35.6\text{ k}\Omega,$$

or the next closest standard value, 36 kΩ. Recall that for this equally-terminated filter, both the first and last capacitor in the circuit are paralleled by a resistor of this value.

We calculate R_3 the same way:

$$R_3 = \frac{X_3}{2\pi \cdot C \cdot f_{-3dB}} =$$

$$\frac{2.393}{6.28 \cdot 2.2 \cdot 10^{-9} \cdot 3\text{ kHz}} = 57.4\text{ k}\Omega,$$

or 56 kΩ, the closest standard value.

This information should provide the average ham with the ability to design pretty much any filter he might need. This article is in no way an attempt to cover this topic fully—there are entire texts on the design of filters—and there is a limit to the quantity of material that can be presented in a magazine format. However, here's a starting point from which the novice filter designer may proceed on his own. Have fun—it's easy! 73

SHAPE	R_{input}	X_1	X_2	X_3	X_4	X_5	R_{output}
Bessel	1.0	0.318	0.877	0.809	2.417	0.953	1.0
Butterworth	1.0	0.631	1.604	2.032	1.604	0.631	1.0
0.1 dB Chebychev	1.0	1.298	1.564	2.230	1.564	1.298	1.0
0.21 dB Chebychev	1.0	1.475	1.475	2.394	1.475	1.475	1.0
0.3 dB Chebychev	1.0	1.600	1.406	2.495	1.406	1.600	1.0
1.0 dB Chebychev	1.0	2.207	1.130	3.104	1.130	2.207	1.0
3.0 dB Chebychev	1.0	3.483	0.763	4.540	0.763	3.483	1.0

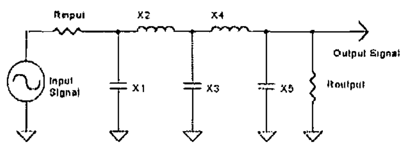

Table 4. Normalized filter coefficients for five-pole filters.

Keys to Good Code

Unlocking the secrets of sending precise Morse code.

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Have you noticed how some operators send CW (Morse Code) so that every letter and word is unmistakable, while others send so many words that are hardly readable? There are good reasons for the latter difficulty and some simple remedies. But first, there are six devices to discuss, all of which have been or are being used to send CW. These are the:

(1) straight key, or hand key;
(2) sideswiper key, cootie key, or double key;
(3) semiautomatic key, or bug;
(4) electronic keyer;
(5) Boehme-head type machines; and
(6) keyboards and computer circuitry.

All of these can be used to send perfect or nearly perfect code, but in many cases the code does not come out all that well. I've spent many years teaching hundreds of operators how to send both the International and the American Morse codes, and I hope the information in this article will help every reader improve his or her sending.

The straight key

The original and simplest key is the straight key, also known as a hand key. It is used to send at slower speeds, usually in the five to 18 word-per-minute (wpm) range. With skilled operators, it can put out very good 20 to 25 wpm code. There were some very skilled operators in the past who could vibrate their hand and fingers in such a way as to send at 35 wpm! However, there are few people—if anyone—who can do this anymore. A speed of 25 wpm is really pushing it with a straight key for most operators. A side view of a basic straight key is shown in **Fig. 1**. Pushing the knob down closes the keying contacts that are normally connected to the keying circuit in a transmitter, or possibly to a practice oscillator. The contact gap should be about 1 millimeter (mm), a little less than 1/16 of an inch. This is the key for anyone, beginner or old-timer, who wants to learn to send code correctly. It was widely used by professional shipboard radio operators because it produced the easiest to copy CW through QRN or over long distances and because it provided no difficulty when the ship was rolling. It should be the first key to be mastered by anyone, because it is the best one with which to learn to hear and understand the extremely important requirement of proper spacing between dots and dashes, letters and words.

Spacing

If there is any one most important thing to learn about sending CW, it is proper spacing. There is probably only one chance in perhaps 10 that operators (you?) space properly. If the proper spacing is not used, a receiving operator may not be able to guess what is being transmitted. There is nothing more discouraging to hear than a string of well-made letters, with no spacing to indicate where one word stops and another starts!

The theory of the timing of dots and dashes is simple enough. The length of a "dot" is the basic time element or "unit" of code sending. A "dash" is three units long, never two, although four or even more is quite readable to the human ear (long dashes can give the code its well-touted and interesting "swing," but computers hate it). The spacing between a dot and a dash in a word is one unit long. The spacing between any two letters in a word is three units long. The spacing between any two words is seven units. Between the end of a word and a comma or period

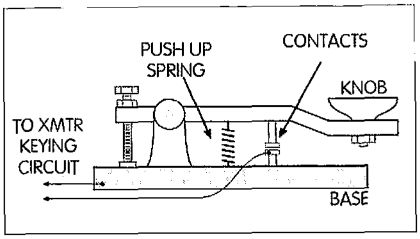

Fig. 1. Essentials of a straight key.

there should be three units, not seven units. Punctuation marks should be spaced as they would be when typing them on a keyboard.

A good practice to develop a feeling for spacing for anyone trying to learn, or to improve sending, is to make a letter and then with your little finger tap the desktop before sending the next letter of that word. Between any two words, tap the finger twice on the desktop. Later, after you develop reasonable speed and ability, only tap the desktop between words. Eventually the sense of proper spacing will be ingrained in the subconscious and no more desktop tapping should be necessary. By that time, each letter should be made as one simple or complex sound. A 10-letter word should be heard as 10 simple or complex sounds, all forming one tied-together complex group of sounds, with no audible long (or lack of) spacing anywhere.

Using the straight key

A desirable way of using a straight key is to place the tip of the first finger on the key knob at a position of about 12 o'clock, with the thumb lightly touching the underside of the knob at about seven o'clock. Flip the three other fingers downward about halfway to the desktop. This should close the key and open it again as the fingers swing back upward. Note that the wrist will push upward as the fingers go down. This is a correct way to make a dot. If the wrist goes down when the key goes down it is the arm that is doing the keying. Fingers are so much less tiring to use! (I once sent messages with a straight key for five hours with no stopping, from the Yangtze River to San Francisco, after my ship was bombed—but that's another story.) Flip the fingers downward twice rapidly for two dots. Three times for three dots, etc. Practice making some eight-dot groups. All dots should come out with equal timing. Note the wrist: Make sure it goes up when the fingers go down.

To make dashes, flip the fingers downward farther and hold the knob down for at least three times as long as with dots. Practice making dashes in groups of eight or more. Note the wrist action with dashes—it should move farther upward than when making dots.

Practice making a string of 10 dot-dash (• – • – • –) groups strung together. Then practice making a string of 10 dash-dot (– • – • – •) groups strung together. The next practice is 10 • • – • • – groups strung together. Then 10 – – • – – • groups. This exercise will provide practice in starting and making most letters and numbers.

I assume that you already know the International Morse code. Here are some practice exercises for learning to send letters, words, sentences, and numbers. Concentrate particularly on spacing properly.

A QUICK BROWN FOX JUMPS OVER THE LAZY DOG, 1234567890.
PACK MY BOX WITH FIVE DOZEN LIQUOR JUGS, 0987654321.

These two lines contain all of the English letters and numbers, plus commas and periods. When you can send these correctly with proper spacing between letters and words, with no hesitation anywhere (which takes quite a while), try sending them backward. When this can be done both forward and backward *without any errors*, you should be able to send fairly well with a straight key! With a beginner the speed may be only five or six wpm. With practice, the speed should come up to well over 10 wpm, and eventually to perhaps 16 to 20 wpm. To compute code speed, five normal letters plus a space is considered one word. If the standard word PARIS can be sent 10 times in 60 seconds, with proper spacing between words, the sending speed is 10 wpm.

The sideswiper key

This is a very old but simple form of a speed key, first used by American Morse railroad telegraphers, probably sometime around the mid-1800s. It is far easier to operate than a straight key and with it the code can be sent about 50% faster. It is also called a "cootie key," and sometimes a "double key," because it works like two straight keys fastened bottom to bottom. The origin of the term cootie key seems to be unknown, but very possibly had some tie-in with the "bug" first used as a symbol on early-day Vibroplex® semi-automatic keys.

A double key can be constructed by using two straight keys, fastened base to base, and mounted at 90° from their normal position. Another way to make a sideswiper key is to mount a three-inch piece of hacksaw blade solidly at one end, so the free end can swing back and forth between two fixed contacts at its near end. An insulating-material paddle should be fastened to the free end of the hacksaw blade. A top view of a basic sideswiper key is shown in **Fig. 2**. If a metal base is used, the right-hand and left-hand contacts must be insulated from it. The gaps between both fixed contacts and the flexible arm should each be about one millimeter with the arm in its resting position.

To operate a sideswiper key, the first finger presses the paddle toward the thumb to make the flexible arm hit the stationary left contact. (Explanations are for right-handed operators. Lefties will know what they should do.) A quick motion in that direction makes a dot. If the contact is held at least three times longer, a dash is made. An appreciation of the difference in time

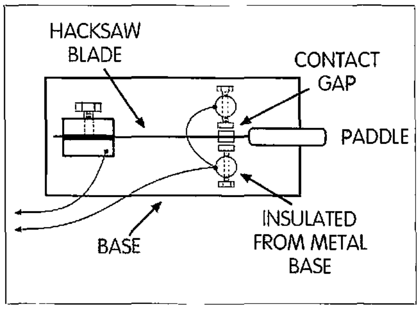

Fig. 2. Essentials of a sideswiper key.

between a dot and a dash learned with a straight key is important. The finger could be used to key dots and dashes the same way as is done with a straight key, but with a sideways instead of up-and-down motion.

Now comes the interesting part! The thumb can press toward the first finger, moving the paddle to the right against the right-hand contact. If it makes only a quick movement, it will produce a dot. If the contact is held three times as long it will make a dash. Code can also be sent horizontally with the thumb this way. To send the letter "A," which is *dot-dash*, the first finger can make the dot and the thumb can *immediately* be pressed in the opposite direction to make the dash. However, if the thumb is used to make the dot, the first finger must immediately be pushed to the left to make the dash! Every letter or number can be started by either the thumb or the finger! It is up to the operator to be able to make the proper length dots and dashes whether they are being made by thumb or finger. Care must be taken to maintain all spacings properly. These are tricky keys to use. The straight key should be mastered first to ensure properly-learned spacings. Sideswiper keys usually produce heavy dots. If you like challenges, make yourself a sideswiper and try sending with it!

The semiautomatic key

Around the turn of the 20th century, the semiautomatic key, or bug, was developed. It has been made in many forms by many people and companies. Most of these keys are made to operate horizontally, but some operate vertically. Basically, a bug, which seems to be a generic term used today for semiautomatic keys, is somewhat like a

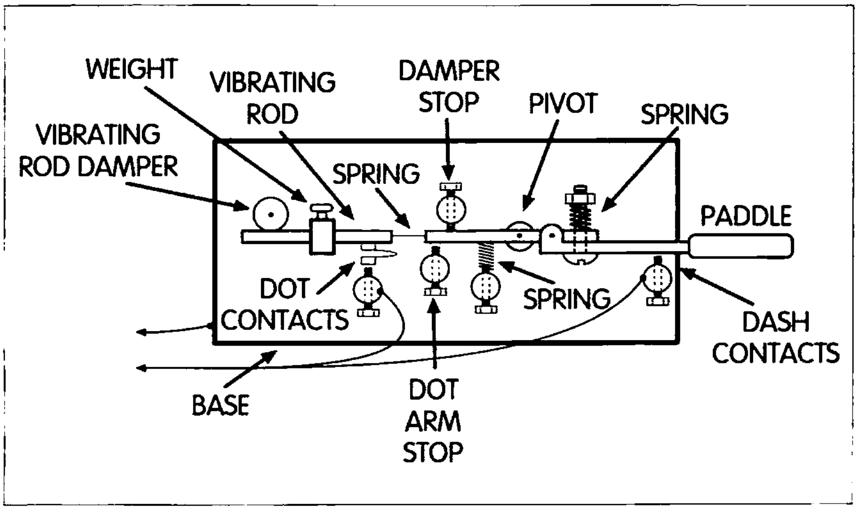

Fig. 3. Essentials of a semiautomatic key.

sideswiper key, but is much better than the simple old cootie key. A top view of a basic bug is shown in **Fig. 3**. When the first finger is pressed against the paddle, it can be worked the same as the first finger on a sideswiper key to make dashes. A horizontal form of straight key sending can also be produced with the first finger as with a cootie key.

When the thumb is pressed against the paddle, it moves the near end of the main pivoted bar or shaft to the right. The far end of the bar moves to the left because of the pivot. Attached to the main bar on the far side of the pivot is a short piece of spring steel; attached to the end of that is the weighted vibrating rod. As the weighted rod vibrates from side to side, it makes and breaks a connection as its springed contact hits and rebounds from the fixed dot contact, thereby producing a series of dots. So, the thumb determines how many dots are made and the first finger must make all of the dashes. It is up to the operator to determine how long to make the dashes so that they are at least three times the length of the dots. It takes a trained ear to do this, an ear that is usually developed by properly-learned straight key operating.

As long as receiving operators are copying by ear, longer-than-normal dashes will sound OK, but short dashes will produce a poor-sounding code. The spacing between the dash contacts, and the travel between the bar to the dot-stop when the paddle is pushed to the right, should both be about one millimeter. The thumb and finger should travel reasonable distances and strike the paddle fairly hard. (This was very important when bugs were used on ships during times when the seas were heavy and the ship was rolling.)

Where the movable weight is placed on the vibrating rod determines the speed of the rod vibrations and therefore the speed of the dots. The farther the weights are out toward the far end of the vibrating rod, the slower the vibrations ... and the slower the dots. You will find that if the stationary dot contact is moved up against the vibrating contact so that only about 10 to 12 dots are made before the dot contacts settle into a constant contact, the dots will be made at a desirable hearing length. Theoretically, the space between dots should equal the dot length. However, for the receiving operator it is better if the dots are a little longer than the space between them. These are known as "heavy dots." As mentioned before, "light dots" mean that the space is longer than the dots, resulting in poor-sounding code that may also be hard to read at a distance or under poor conditions, and may not be read properly by computer keyboards. I recommended that a bug not be tried before learning to space properly with a straight key first.

Most good bug operators send and receive in the 20 to 35 wpm range. High-speed bug operators may get up into the 40 to 50 wpm range. Some may think they are operating their bugs correctly at these higher speeds, but if checked with "slip tape" (explained later), most will find that their spacing is almost always rather poor. If they were using an electronic keyer their letter spacings might be much better.

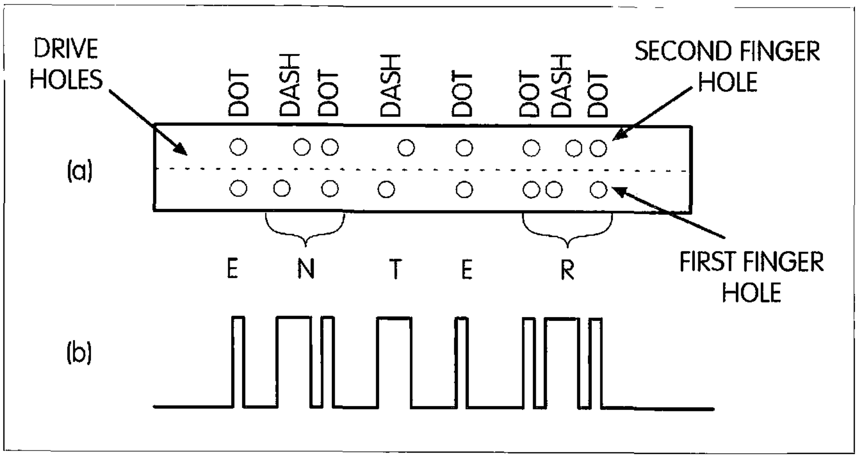

Fig. 4. (a) "ENTER" punched onto a Boehme-head tape. (b) "ENTER" inked onto a slip tape.

The electronic keyer

To improve on the vibrating dots of bugs, which usually have some variation between the first and last dots in letters like H or the numeral 5, there were many magnetic vibrator-type bugs built in the early decades that worked fairly well. Around the 1950s, it was found that vacuum tube vibratory circuits could be used to produce perfect dots, spaces, and dashes. Then the small size and low voltages needed to operate transistors allowed them to take over the modern types of electronic keyers. There are a variety of these devices available today. Basic electronic keyers are improved semi-automatic keys. They use a square-wave electronic oscillator to produce perfect, constant-speed dots and spaces when the paddle is pushed by the thumb. They use the same oscillator with divide-down counter circuits to produce perfect, constant one-third-speed dashes (three times longer). The operator of this type of key does not have to worry about the length of dots or dashes—just the spacing between dots and dashes in letters, the spacing between letters, and the spacing between words. When the control is advanced to increase the oscillator frequency, it makes dots, spaces, and dashes faster.

An electronic keyer is basically two devices. One is the keyer paddle unit, and the other is the electronic circuits unit, with its oscillator, dividers, and other circuitry. The basic keyer paddle unit is essentially the same as a sideswiper, except that it uses two separate contact leads plus the paddle-arm lead (usually at ground potential), all of which are fed to the electronic circuits in the device. (Some of the electronic keyer paddle units can be connected to work a sideswiper key.) Again, I recommend that an electronic keyer not be used before learning to operate a straight key properly. An

electronic keyer can produce the perfect sending once produced only by the old-time commercial Boehme-head code machines.

The Boehme-head-type machines

The Boehme-head and other similar machines were used from the 1920s to the 1960s to transmit perfect high-speed radio code. They were nicely machined little units about six inches square and two inches thick, driven by an adjustable-speed electric motor. Their punched waxed-paper tapes were produced on a special typewriter-like keyboard tape-punching "perforator" machine. The letters punched into these transmitting tapes came out as properly spaced holes. Boehme-head machines sent their perfect code at speeds determined by the driving motor's speed. Code at well over 100 wpm was easily produced.

The tapes they used had three sets of holes punched into them by the perforator. The center perforations were drive holes used to pull the tape along over two little pins that were alternately pushed up and pulled down against the moving tape from underneath. One pin was on one side of the center holes; the second was directly across the tape on the other side of the driving holes. When the first pin came to a punched hole, it would move up through its hole, starting an electrical connection. When the first pin went back down and the second pin pushed up, if this pin also found a hole in the tape it would move up through it, which shut the electric connection off, thereby keying a dot for the transmitter. If the first pin went up through a hole and started an electric connection, but the second pin found no hole, there was nothing to shut off the keying circuit. When the first pin came up again, it could do nothing since the electric connection was still made. However, if the second pin came up again and found a hole to go through, it shut off the electric circuit. In this case, since there were three pin motions between the start and the stopping of the electric circuit, it would key an electric circuit duration three times as long as was keyed for a dot, resulting in a dash being sent. **Fig. 4(a)** shows a five-letter word punched onto a Boehme-head tape.

Tapes were usually punched and fed into a tall box. They were then either wound on a spool or were fed back into a second box so that the first punched material was available to feed into the Boehme-head machine. When slower-speed transmissions were to be made, the tapes could be punched by the operator and fed directly into the Boehme-head, although with a couple of feet of sag in the tape so that the Boehme-head machine would not get ahead of the tape puncher.

Slip-tape machines

Dot and dash tones received on radio receivers could be rectified, and the current developed by them could magnetically pull an inked pen up and down on a moving unwaxed paper "slip-tape" machine. With no signal being received, a straight line would be drawn by the pen along the bottom of the tape. When a dot was received, the ink pen was pulled up and then fell down at the end of the received dot, producing a narrow vertical pulse on the slip-tape, as shown in **Fig. 4(b)**. When a dash was received, the line was pulled up but was held there for the duration of the received dash before dropping back down. Operators ran the slip-tape along the front of their typewriter at a speed controlled by a foot pedal, usually at greater than a 40-wpm reading speed. The received letters and spaces were visually recognized and typed as letters and words on the typewriter keyboard.

Using a slip-tape device is probably the best way to check radio code sending. Any dot, dash, letter, or spacing made improperly is shown visually and permanently, allowing scrutiny and analysis. I have used such a device to graphically illustrate to students what they were doing wrong with their sending (but I also had to demonstrate to them what proper sending should look like).

Before computer-programmed keyboards were developed in the late 1970s, some Boehme-head machines were used on the amateur bands. Boehme-heads

produced perfect code, but they used up an awful lot of paper tape!

The computer keyboard

When a computer keyboard (KB) operates with a Morse Code software program, plus a data controller unit to key the transmitter, it is capable of producing code transmissions as perfect as that from a Boehme-head machine. Besides not requiring the handling of dozens of yards of paper tape in one busy evening, a computer keyboard system has no moving parts other than the KB itself, and is soundless. The monitor screen of the computer shows the letter and words being typed and transmitted. The program can be adjusted to transmit Morse code at any speed desired, from very slow to very fast. With such systems in common use, amateurs can easily produce perfect code practice transmissions at high speed. As a result, some amateurs have learned to copy in their heads up to—and even above—100 wpm! At such speeds they are probably learning to recognize many whole words, such as "the," as complex sounds instead of hearing their separate letters. They copy in their heads because trying to type out copy at speeds near 100 wpm is quite difficult.

I highly recommended that all CW operators learn to copy in their heads as soon as they find they can write down most of what they hear. It is really the only way to enjoy CW communicating. Those who talk down Morse code operating have probably never learned how much fun it can be when Morse code is copied properly. Commercial operators copy in their heads but always type several letters behind those being sent. This way, if the sending operator makes a mistake in sending, the error sign that is sent stops the receiving operator and the improper letter(s) is not typed onto the message blank. Copying behind by several letters is the sign of a good radio operator.

With a proper software program, computers can also be used to copy code off-the-air and display it on the screen. But the code must be sent almost perfectly. There is a little latitude in the length of dots, spaces, and dashes, but not a lot. If hand sending is not nearly perfect, the displayed copy may not be very good. With computerized transmission and reception, assuming no QRM or QRN, the displayed copy of previously typed information held in memory can be perfect to well over 100 wpm. Printouts may also be made of what is shown on the screen.

Few amateurs can handle a KB well enough to put out proper code at 50 to 100 wpm, so real-time transmissions made at such high speeds usually sound broken up to listeners. The overall transmission speed will be only the typist's typing speed. For a hunt-and-peck keyboard typist, 25 wpm is not an uncommon overall sending speed, although the letters might be set to transmit at 50 wpm or more. This would not be considered good communications transmitting—the result sounds jerky to any operator listening and trying to copy the transmission.

Very readable computer monitor displays can be produced by an electronic keyer, provided the transmitted dot, dash and inter-word spacings are good.

Keyboard transmissions are expected to sound perfect, but if words are mistyped, are misspelled, or if they are broken up with unwanted spaces while desired keys are being looked for, poor copy will result for radio operators who are trying to copy by ear or in their heads. To produce proper-sounding code, KB systems should not be set to transmit at a speed faster than the typist can type well.

If KB transmission circuitry involves magnetic relays, there is the possibility that the transmitted dots will turn out to be quite light, resulting in less-than-desirable emissions. Some keyboard circuits have built-in "weight" controls by which the length of dots and dashes can be adjusted to reduce light dot transmissions.

Similar KB and computer equipment can be used to transmit and receive radio teletype information on the ham bands. However, many old-timers wax nostalgic for the clatter of the old machines and the yards of yellow paper, or printed tape, that spewed out of the machines.

Some very new amateur transceivers have been developed that are operated by the keys on a KB coupled into the transceiver. There are no dials to rotate to select frequencies. All of the functions of sending and receiving CW, RTTY, packet, etc., are controlled either with the KB keys or with a mouse. CW can be sent by using the keys on the KB, or by plugging in any type of key desired into the transceiver. Phone? Just plug a microphone into the transceiver.

Punctuation

Regular amateur CW communications use very few punctuation marks. The exceptions to this are KB communications. Since all of the punctuation marks are available on all keyboards, they are becoming more common.

In general, amateurs use BT as an end of a thought, or to indicate that the sending operator is thinking about what is going to be sent next. (The overlining of the $\overline{BT}$ is used here to mean that B and T are sent together as one character with no spacing between them, to sound like dahdidididah.) Some of the CW punctuation and operating signs heard on the bands are:

Period—$\overline{AAA}$
Comma—$\overline{MIM}$
Question mark—$\overline{IMI}$
Fraction-bar or slash—$\overline{DN}$
Quotation marks—$\overline{AF}$
Parenthesis—left $\overline{KN}$, right $\overline{KK}$
Dollar sign—$\overline{SX}$
Apostrophe—$\overline{WG}$
Error sign—$\overline{HH}$
End of a message—$\overline{AR}$
End of a QSO—$\overline{SK}$
Wait—$\overline{AS}$
Start your transmitting—K
Received OK—R

The key to the key

Regardless of the type of device an amateur uses to produce CW, sending it correctly will always be a challenge. One rule never changes, though: Practice makes perfect!

Number 37 on your Feedback card

QRP Temptations

Here's a roundup of low-power kits out there today.

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Kit-building continues to build momentum as hams rediscover the joy of building their own equipment. Such enthusiasts have been treated again this year with the introduction of two major multiband transceivers, and the reintroduction of a single-band transceiver kit with an important new companion course.

This article describes the three latest transceivers that have become available, along with a roundup of my favorite "classic" kits.

I hope you'll discover the joy of building your own radio. Your knowledge of amateur radio will be greatly enhanced, and you'll discover that a QSO made on a home-brew rig is more satisfying than 10 QSOs made on a commercial transceiver.

K2, by Elecraft

The K2 is the most high-tech amateur radio transceiver kit known to mankind; it was designed by Wayne Burdick N6KR and Eric Swartz WA6HHQ. Wayne is known primarily for his NorCal QRP Club and Wilderness Radio designs, including the NorCal 40/40A, Sierra, and SST transceivers, as well as multifunction accessories including the KC1 and KC2. He was also recently inducted into the QRP Hall of Fame. Eric is a talented engineer/entrepreneur who has been involved in several highly successful startups in Silicon Valley. The K2 is a synthesis of their different styles, emphasizing both big-rig performance and QRP efficiency.

The K2 is a microprocessor-controlled 10- through 160-meter CW/SSB transceiver with a built-in digital display and a dazzling array of features more typical of a major league commercial rig. These include a PLL synthesizer; dual VFOs capable of working split frequency; direct keypad entry of frequencies and operating parameters; RIT/XIT; 10 memories (each with A/B VFO frequencies and other operating settings); back-lit LCD; built-in speaker; memory keyer with multiple message buffers and auto-repeat; variable CW crystal filter (250–1200 Hz); and bar graph S, RF, SWR and ALC meters. Whew!

The K2 also offers an optional antenna tuner, noise blanker, and internal 3 Ah battery.

The radio embraces design values and objectives that are common to other radios designed by Wayne. It is small, measuring only 2.9 x 7.8 x 8.2 inches, and can be configured to draw as little as 100 mA, making it ideal for use on Field Day or on battery-powered expeditions. The radio is also ideal for fixed station use.

Despite the robust set of features offered by the K2, the radio was designed for ease of construction and testing. Like the Sierra, the radio uses "no-wires" construction, with most controls mounting directly to the PC board. The user's guide is written with incremental assembly and testing, so that modules can be tested in stages, avoiding the dreaded "smoke test." In addition, the radio has built-in test equipment, so the K2 can be aligned with only a digital voltmeter. The K2 even includes a built-in frequency counter.

There are so many novel features included in the radio that it is impossible to adequately summarize them in this brief article. I encourage you to visit the Elecraft (that's "ele" as in "elegant")

Continued on page 38

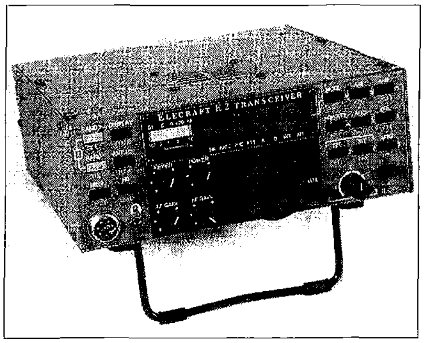

***Photo A.** Elecraft's K2 transceiver.*

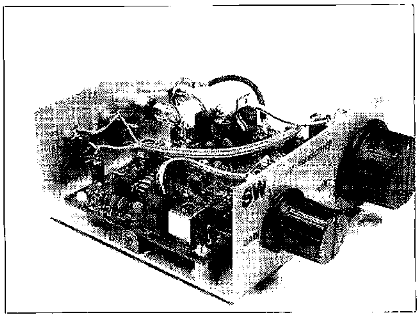

Photo B. The SW+ series is made by Small Wonder Labs.

Web site (see URL at end) for more details.

As of this writing, the K2 was being put through possibly the largest and most ambitious field test program ever used with an amateur radio kit, with dozens of builders around the world (including me) interconnected by a discussion group over the Internet set up by Elecraft.

The K2 basic configuration sells for $549. Pricing for options is as follows: SSB with speech compressor, $79; 160-meter with second receive antenna, $29; noise blanker, $29; internal antenna tuner, $125; and internal 2.9 Ah battery, $79.

OHR 500, by Oak Hills Research

The OHR 500 is a new five-band CW transceiver for intermediate to advanced builders. The rig is an upgrade of the classic OHR 400 fourbander. The radio is excellent as a base station QRP transceiver, because it is switch-selectable for operation on 80, 40, 30, 20, and 15 meters, and band changing is thus effortless. The OHR 500 comes with a built-in analog dial, but you can soup it up with the companion DD-1 "digital dial" outboard LED display.

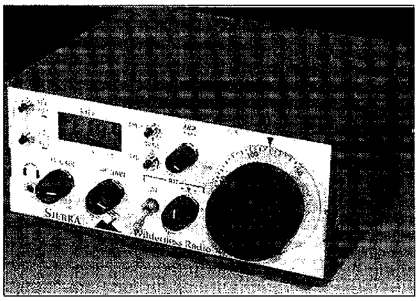

Photo C. Wilderness Radio's Sierra model.

The OHR 500 has a super receiver with QSK and a diode ring mixer. The radio really excels at copying very light signals. But the OHR 500 is not ideal for backpacking; it has a hefty cabinet measuring 8.25 x 8.25 x 4 inches (weighing almost four pounds), and the radio draws approximately 270 mA on receive, slightly less current than its predecessor.

The OHR 500 comes with excellent documentation, and was a pleasure to build. I really took my time with the radio, and savored the experience of building the kit. The radio has three printed circuit boards that mount on a solid internal aluminum chassis. The boards are the oscillator, receiver, and transmitter. Interconnecting the boards and panel components is accomplished with approximately 40 point-to-point color-coded wires. Again, the documentation for performing the wiring is first class, but this amount of wiring should typically not be attempted by first-time builders. (Oak Hills offers the OHR 100, which is ideal for beginners—see below.) The OHR 500 has built-in RF probes, so the unit can be aligned with a digital voltmeter and an accurate frequency source such as the companion DD-1 digital dial.

The OHR 500 features RIT, AGC, narrow CW filter, and full QSK, and delivers 5 to 7 watts on all bands except for 15 meters, where it delivers 3.5 watts. The kit comes with a punched and screened enclosure, jacks and knob set, and silk-screened printed circuit boards. It has many nice finishing touches, including a phono jack on the back with VFO output for hooking up the digital dial, a front panel power level control, and an LED lamp. However, the radio does not include a built-in speaker.

The OHR 500 retails for $349, and the digital dial sells for $74.

SW-40+, by Small Wonder Labs

The SW+ transceiver series is a modest single-band radio with a bold new mission: The kit is now available with the "Elmer 101" course published by the Northern California QRP Club. The course enables the SW+ to become a laboratory for learning the fundamentals of amateur radio design and kit-building.

The Elmer 101 course comes in the form of an 82-page book published by NorCal as the club's "Autumn 1998 QRPp Special Issue." The book provides step-by-step lessons for building the SW+, instructions for testing the kit as you build, circuit theory and analysis, and test bench procedures.

The course is filled with experiments, so that builders can see the results of changes in parts values and circuitry; it also incorporates in-depth questions and answers.

The SW+ is a single-band transceiver for either 80, 40, 30, or 20 meters. The rig features a superhet design with crystal filtering. The radio delivers approximately 2.5–3 W output, and draws a meager 16 mA on receive. Construction uses a double-sided silk-screened circuit board, and requires modest wiring to connect the case components.

In addition to the "Elmer 101" course, the SW+ series has been updated and re-designed, and features a new optional enclosure. The new design resulted in the number of toroids dropping from eight to five.

Congratulations to NorCal and Small Wonder Labs for teaming up to create this robust kit-building laboratory.

The SW+ transceivers retail for $55, and the optional enclosure sells for $35. Small Wonder Labs sells an optional RIT for $18, and an optional "FREQ-Mite" PIC-based Morse frequency counter device for $20.

Oldies but goodies

In addition to the new kits above, be sure to think about building one of these great "classic" projects:

WM-2 QRP Wattmeter, by Oak Hills Research

The WM-2 measures forward and reflected power, with power ranges of 10 W, 1 W, and 100 mW. The WM-2 replaces the WM-1. The WM-2 comes in a smaller package, and provides users with the option of using a battery or an external 13.8-volt source. $84.

OHR 100A, by Oak Hills Research

The OHR 100A is a series of single-

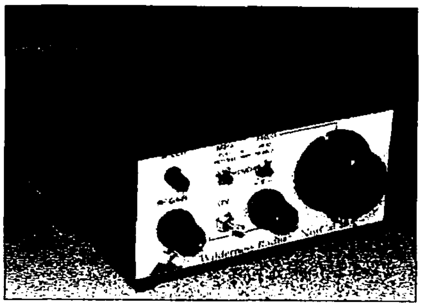

Photo D. The NorCal 40A, also by Wilderness.

band transceiver kits for either 40, 30, or 20 meters, covering 70 kHz of each band. The radio features RIT, AGC, variable bandwidth CW filter, variable power output, and full QSK, and delivers five watts output, a full QRP "gallon" which is useful for Field Day. The kit is excellent for first-time builders. It features a silk-screened printed circuit board, screened and punched enclosure, simple wiring using Molex connectors, and on-board DC test points, so that the radio can be aligned without an oscilloscope. $119.

Logikeyer III Memory Keyer, by Idiom Press

The latest in the Logikeyer series, the Logikeyer III now features six memory locations and nonvolatile storage memory in EPROM. The postage-stamp-size Logikeyer III has a robust array of superlative keying features and options, such as automatic sequencing of serial numbers for contests. $58.

Sierra, by Wilderness Radio

The Sierra is a multiband superhet transceiver with up to nine interchangeable band modules for operation on 10–160 meters. Despite its tremendous sophistication, the Sierra also has characteristics that make it an excellent kit for intermediate builders. The jacks and switches mount directly to the board, so there is no point-to-point wiring. The Sierra is ultra portable, measuring only 5.5 x 6.5 x 2.5 inches (weighing less than two pounds), and has an extremely low current drain of 35 mA. So the Sierra is ideal for portable and backpacking use, and ideal for battery operation and Field Day. The Sierra features RIT, AGC, variable bandwidth CW filter, and full QSK, and delivers two to three watts output on all bands. The kit comes with a punched and screened latched enclosure, jacks and knob set, and silk-screened printed circuit board. $295 for the basic kit with three band modules.

NorCal 40A, by Wilderness Radio

The NorCal 40A is an ideal kit for beginners. The jacks and switches mount directly to the board, so there is no point-to-point wiring, making the radio very easy to build. I assembled mine in just two evenings. The NorCal 40 comes in a tiny 4 x 4 x 2-inch enclosure (weighing less than one pound) with a very snazzy two-tone blue paint job. The kit comes with a punched and silk-screened latched enclosure, jack and knob set, and a first-class silk-screened printed circuit board. This 40 meter superhet CW transceiver has been optimized for extremely low current drain of only 15 mA on receive. The radio features RIT, AGC, 400 Hz CW filter, and full QSK, and delivers three watts output. Wilderness offers another ideal kit for beginners, the two-watt Super Simple Transceiver (SST), which comes in an even smaller enclosure than the NorCal 40A. The NorCal 40A sells for $129, while the SST sells for $85.

KC2, by Wilderness Radio

The KC2 is a multifunction accessory with an LCD digital frequency counter, memory keyer, S-meter, and wattmeter! Measuring only 1.1 x 2.9 inches and drawing only seven milliamps, the KC2 has become the first accessory that I put in each of my home-brew QRP rigs. The KC2 has a respectable memory keyer, but lacks the dazzling array of keying features (like automatic sequencing of serial numbers) found in the Logikeyer III. Keyer memories are stored in nonvolatile memory; however, memories do not have separate buttons for each partition. The KC2 is an ideal companion to the Sierra, and Wilderness Radio offers a replacement front panel for the Sierra to accommodate the LCD display. $75.

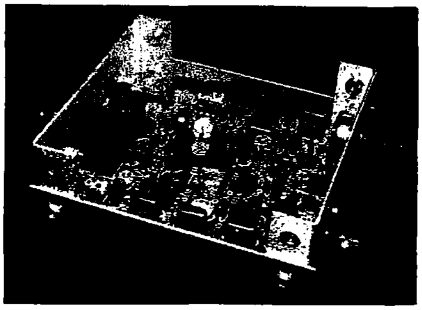

Photo E. Wilderness' Super Simple Transceiver (SST).

Automatic QRP Tuner, by LDG

This novel kit is a subminiature automatic antenna tuner for QRP operation. Measuring 5 x 6.5 x 1.3 inches,

Continued on page 40

QRP Temptations

continued from page 39

and weighing in at only 15 ounces (with enclosure), the tuner is able to tune most antennas to an SWR of better than 1.5:1 in less than 1.5 seconds. The device is microprocessor-controlled, and uses tiny relays to switch toroids and capacitors to achieve a match. The LDG tuner features a built-in SWR meter using a bank of four LED lamps. $125 with enclosure. If you want to install the tuner inside your favorite radio, it's available without the enclosure for $100 and tips the scales at only four ounces.

I hope this article encourages you to build your first amateur radio kit. Why not discover the joy of making a contact or working a new DXCC country on a radio that you made yourself? Happy building!

This article is dedicated to the memory of Ernie Schnitz (SK) AD4VA, who assisted me with the on-air testing of many of my kit projects.

Sources

Oak Hills Research
20879 Madison Street
Big Rapids MI 49307
(616) 796-0920
[http://www.ohr.com]

Idiom Press
Box 1025
Geyserville CA 95442-1025

Elecraft
P.O. Box 69
Aptos CA 95001-0069
(831) 662-8345
[http://www.elecraft.com]

LDG Electronics
1445 Parran Road
St. Leonard MD 20685
(410) 586-2177
[http://ldgelectronics.com]

Wilderness Radio
P.O. Box 734
Los Altos CA 94023-0734
(415) 494-3806
[http://www.fix.net/jparker/wild.html]

Small Wonder Labs
80 East Robbins Avenue
Newington CT 06111
[http://www.fix.net/~jparker/sml/freqmite.htm]

QRX

continued from page 8

Snyder and two others on suspicion of attempted murder.

The newspaper reported that Snyder had a string of previous convictions, and his driver's license had been suspended. The injured motorist was treated at a Los Angeles area hospital.

From *The Orange County Register* and the ARRL, via *The Minuteman*, newsletter of the MMRA (Marlboro, Massachusetts), Andy Morrison N1BHI, editor.

"Worst Blizzard Since 1978"

A major winter storm paralyzed much of the Midwest over the past New Year's holiday. Heavy snow that accumulated to more than a foot began falling on New Year's Day. The accompanying winds caused drifts of up to three feet in some locations. On top of that, warming temperatures on Saturday afternoon, January 2nd, caused the snow to turn to rain. Then the temperatures dropped again below 30° F, causing the formation of ice that evening.

This scenario caused officials in southwest Ohio to issue a Level 3 Emergency Alert. Under a Level 3 Emergency Alert, all non-essential motorists are ordered to keep off highways, under threat of arrest and vehicle confiscation.

Even in the worst blizzard conditions, there are some people whose jobs are essential; hospital workers, for example, must get to work. The Kettering Medical Center Amateur Radio Association, near Dayton, Ohio, was called out to assist with communications and logistics of moving essential hospital personnel to the hospital facility: amateurs with four-wheel-drive vehicles participated in transporting hospital personnel or rode with non-amateur volunteers to provide them with communications.

The Kettering Medical Center was not the only hospital needing assistance. Green County Memorial Hospital, in nearby Xenia, requested the assistance of X-WARN—the Xenia Weather Amateur Radio Network. Green County amateur radio operators with four-wheel-drive vehicles lent a hand to transport hospital personnel to and from work. Green County Memorial Hospital in Xenia requested assistance and half a dozen ham-radio-equipped vehicles were pressed into service, along with amateurs at the hospital who acted as communications officers. In Springfield, Ohio, the Clarke County ARES provided amateur radio assistance to Mercy and Community Hospitals.

In Clarke County, Springfield radio amateurs were out on the roads transporting hospital and rest home personnel. In one case, they transported a kidney dialysis patient home after treatment. In addition to driving their own four-wheel-drive vehicles, amateurs also manned the Clarke County Emergency Communications Center.

Ten inches of blowing snow and freezing rain put Indiana into a state of emergency, too. By early Saturday morning, January 2, most Hoosier counties had declared snow emergencies, forcing people to stay home. Roads, airports and shopping malls were closed.

Local hospitals declared a need for drivers with four-wheel-drive vehicles to transport dialysis patients to and from local hospitals. Many central Indiana amateurs met the need—not only with the vehicles—but with communications during the first trying hours of the storm.

Indiana State RACES Coordinator Dave Crockett WA9ZCE said that weather and road reports were updated using high-frequency amateur radio links. Most of the affected midwestern states found the MID-CARS Net an efficient way to share vital road and weather conditions. As one amateur radio operator put it: "It's nice to know that amateur radio can still get out when your local world comes to a sliding halt."

From *Newsline*, Bill Pasternak WA6ITF, editor.

Swiss No-Code

Switzerland's national amateur radio society has done an about-face on the issue of abolishing Morse code testing.

Last November the society's journal published a statement regarding the code. It said that Morse code testing in the amateur service no longer serves any useful purpose.

The commentary by the Swiss angered the neighboring Germans. Their Deutscher Amateur Radio Society—the DARC—was more than a little uneasy about the Swiss society's position and made its displeasure widely known.

After some discussion, the Swiss have backed away and issued a new statement. This one says that the Board of Directors of the national society have not yet reached any definitive decision on the future of Morse testing.

But even here there seems to be a bit of controversy, because last November's magazine article was the result of a vote at the annual meeting of the organization's regional presidents.

At that gathering, all of them voted to urge the abolishment of code exams.

From *Newsline*, Bill Pasternak WA6ITF, editor.

Number 41 on your Feedback card

SPECIAL EVENTS

Listings are free of charge as space permits. Please send us your Special Event two months in advance of the issue you want it to appear in. For example, if you want it to appear in the June issue, we should receive it by March 31. Provide a clear, concise summary of the essential details about your Special Event.

MAR 13, 23, 27

ST. LOUIS COUNTY, MO All-Day SKYWARN Weather Observation Training will be offered by the St. Louis County Police, Office of Emergency Management, Sat. March 13th, and Sat. March 27th. SKYWARN Level 1 classes will be presented in the morning, and classes resume in the afternoon with the Level 2 program. Level 1 classes are also available on the evening of March 23rd. For locations, call the *Severe Weather Info Line, (314) 889-2857,* for a taped message and additional info. All are welcome, including those from outside the area. Free parking. Certification provided for R.A.C.E.S. and SKYWARN, all at no cost. One need not be a ham radio operator to attend and participate in the program.

MAR 14

INDIANAPOLIS, IN The Indiana Hamfest & Computer Show will be held at Indiana State Fairgrounds, Indianapolis IN. See advertisement in Jan. *73*, page 59, or Feb. *73*, page 27.

STERLING, IL The Sterling-Rock Falls ARS 39th Annual Hamfest will be held at the Sterling High School Fieldhouse, 1608 4th Ave. Free parking, including areas to accommodate self-contained campers and self-contained mobile homes. There will be a large indoor flea market featuring radio, electronic, computer, and hobby items. Tickets are $3 in advance, $4 at the door. Tables are $5 without electricity, $6 with electricity. Bring your own cord. Setup Sat. 6 p.m.–9 p.m. and on Sun. beginning at 6 a.m. Doors open to the public at 7:30 a.m. Sun. Use only the north doors on Miller St. Talk-in on 146.25/.85 W9MEP rptr. For info and advance tickets/tables, contact *Lloyd Sherman KB9APW, Sterling-Rock Falls ARS, P.O. Box 521, Sterling IL 61081-0521; or call (815) 336-2434. E-mail [lsherman@essexl.com].* Advance ticket deadline is Mar. 1st. Please include an SASE with payment.

MAR 20

STUART, FL The Martin County ARA will hold its 23rd Free Hamfest on March 20th at the Martin County Fairgrounds in Stuart. Free admission, free tailgaters, generous prizes. MCARA supports an active recruiting, training, and testing program for new amateurs, and supports the scholarship program for amateur students. For more info, contact the *MCARA, P.O. Box 1901, Stuart FL 33495.*

MAR 20–21

MIDLAND, TX The Midland ARC will hold their annual St. Patrick's Day Hamfest on March 20th and 21st from 9 a.m.–5 p.m. on Sat., and from 8 a.m.–2:30 p.m. on Sun., at the Midland County Exhibit Building. Features include a flea market, dealers, tailgate area, T-hunts, and a full service concession stand with hot meals. VE exams will be given at 1 p.m. on Sat. Pre-registration is $7, $8 at the door. Tables are $12 each for the first four, and $17 for each additional table over four. Contact the *Midland ARC, P.O. Box 4401, Midland TX 79704; or E-mail Larry Nix N5TQU at [oilman@lx.net].* You can also see a hamfest flyer and download a registration form at *[http://www.lx.net/edge].*

MAR 21

JEFFERSON, WI The Tri-County ARC will present "Hamfest 1999" at the Jefferson County Fairgrounds Activity Center, Highway 18 West, Jefferson WI, 8 a.m.–2 p.m. Vendors admitted at 7 a.m. VE exams for new licensees and upgrades. Electricity available. Equipment test table. Handicap accessible. Talk-in on the 145.49 rptr. Admission $4. Six-foot table $5, eight-foot table $6. To reserve tables, send your SASE to *TCARC, W9MQB, 711 East St., Ft. Atkinson WI 53538. Phone (920) 563-6502 eves.: E-mail [tricountyarc@globaldialog.com].*

MAUMEE, OH The Toledo Mobile Radio Assn. will hold the 44th Annual Hamfest/Computer Fair 8 a.m.–2 p.m. at the Lucas County Recreation Center, 2901 Key St., Maumee OH. For details send SASE to *Paul Hanslik N8XDB, P.O. Box 273, Toledo OH 43697-0273. Phone: (419) 243-3836.*

HAMILTON TOWNSHIP, NJ "Hamcomp '99" hamfest will be sponsored by the Delaware Valley Radio Assn., and held at the Tall Cedars of Lebanon picnic grove, Sawmill Rd., Hamilton Twp., NJ. Take I-95 North to I-295 South; exit 60A to I-195 East; exit 2 to Yardville; South Broad St. to end. approx. 3.7 miles; go left at Yield onto Old York Rd., next right onto Sawmill Rd. The site is 1.1 miles on the right. Open to sellers at 6:30 a.m. Open to buyers at 8 a.m. Admission is $6, non-ham spouses and children admitted free. Tailgating space $10, includes one admission. Free parking, ARRL table. Covered table space $15, includes one table and one admission, some electricity. Advance covered space reservations are available. Talk-in on 146.67(-). More info available at *(609) 882-2240 or [www.slac.com/w2zq].* Send payment with SASE to *Hamcomp '99, DVRA, P.O. Box 7024, West Trenton NJ 08628.*

YONKERS, NY The Westchester Emergency Communications Assn. will hold its annual winter "WECAFEST" at the Yonkers Raceway, Yonkers NY. I-87 from the north, exit 4. I-87 from the south, exit 2. Doors will be open from 8 a.m.–2 p.m. Admission $7. Features include new and used equipment, venders, forums, VE exams, demonstrations, and a tech table. Talk-in on the WECA rptr. 147.66/.06 PL 114.8 (2a). Contact *Tom Raffaelli WB2NHC, (914) 741-6606; or the WECA Web site at [WWW.WECA.ORG].*

MAR 27

MICHIGAN CITY, IN The annual Michigan City Hamfest and Computer Flea Market will be held Sat., Mar. 27th at Michigan City High School, 8466 W. Pahs Rd., Michigan City IN, 8 a.m.–1 p.m. CST. Early setup provided for vendors. Admission is $4, children under 12 admitted free with a paid adult. Table reservations and general info is available from *Ron Stahoviak N9TPC, 5802 N 400 W, Michigan City IN 46360. Phone (219) 325-9089.*

WATERFORD, CT The Radio Amateur Society of Norwich will sponsor their 27th Ham Radio Auction, starting at 10 a.m. Setup at 9 a.m. The auction will be held at the Waterford Senior Center. From Hartford, take Rt. 2 south to Rt. 11 to Rt. 85 south. From the shoreline, take Rt. 95 to Rt. 85 north. Talk-in on 146.730(-). Bring your gear to sell (10% commission to RASON). Free admission. Free parking. Contact *Tony AA1JN at (860) 859-0162,* or see the RASON Web page at *[www.ims.uconn.edu/~rason].*

MAR 28

MADISON, OH The Lake County ARA will hold its 21st annual Hamfest on Mar. 28th, 8 a.m.–2 p.m., at Madison High School on Burns Rd. in Madison. The hamfest will feature new and used amateur radio, computer, and assorted electronic equipment, amateur-radio-related forums, an equipment test bench, and VE exams for those interested in earning an amateur radio license. Admission tickets are $5 at the door. Table space for vendors is $8 for a six-foot table; $10 for an eight-foot table. Reserve tables by calling *Roxanne at (440) 256-0320.* Talk-in on the LCARA 147.21 rptr.

APR 10

SPOKANE, WA The Eastern Washington Hamfest and Electronic Show, hosted by the Lilac City ARC, will be held at Spokane Community College, 1810 N. Greene St, Spokane WA. Open 9 a.m.–5 p.m. Setup Fri. 5 p.m.–8 p.m., Sat. 6 a.m.–9 a.m. Advance tickets $5, children under 12 free. Eight-foot seller's tables $12, 10 x 10 commercial booths

Number 42 on your Feedback card

HOMING IN

Radio Direction Finding

Joe Moell P.E. KØOV
P. O. Box 2508
Fullerton CA 92837
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[http://members.aol.com/
homingin/]

A rechargeable alternative and the dancing buzz

If you're going to have a hidden transmitter hunt, the first thing you need is a transmitter to hide. Some hams call it the fox or the "bunny" (not to be confused with the pink furry creature beating the drum on TV). It's more fun when the fox is truly hidden, not just someone sitting in a car with a big antenna on top. That means you need a self-contained transmitter/controller/IDer and enough portable power to keep it going (... and going ...) for the duration of the hunt.

Fox transmitters are not one-size-fits-all. For a Sunday-in-the-park foxhunt where everyone starts only a few hundred feet away, a micro-T running a few milliwatts and concealed in a pill bottle or soda can is great fun. At the other extreme, for the multi-state "All-Day" hunts in southern California, hiders have used big beams, 600-watt RF amplifiers, and gasoline generators. In between are foxboxes using ordinary handie-talkies and mobile rigs. The usual source of power for them is a rechargeable battery pack with either nickel-cadmium (NiCd) or lead-acid (Pb) chemistry.

Both types are popular because they store lots of energy in small packages. But both are plagued with high rates of self-discharge, especially if stored at elevated temperatures. If you don't use your foxboxes for a few weeks, you'll probably find that the batteries are flat when you need them, or they operate for only a few minutes and quit. What's more, if you allow a lead-acid battery to sit in a discharged state for a few weeks, it becomes "sulfated" and won't accept recharging. In other words, it turns into an expensive paperweight!

NiCds have features that make them the most popular choice for powering portable ham gear. Terminal voltage stays relatively constant (about 1.2 V/cell) from near full charge to near full discharge. They can be recharged hundreds of times if it's done properly. Their low internal resistance permits high discharge currents, so high power handie-talkies and portable soldering irons thrive on them. On the down side, such high load currents can cause reverse charging and cell failure in battery packs of unevenly matched cells, when the pack is operated with a high current load in the near discharge state. NiCds self-discharge on the shelf and in the drawer, losing about 1% per day.

The energy available from a NiCd or Pb cell, or pack of cells, is specified in ampere-hours (Ah) or milliampere-hours (mAh). It's the product of the current and time that is available before the terminal voltage falls below the specified discharge point. For instance, a 1 Ah (1000 mAh) pack can be expected to drive a 50 mA load for 20 hours. So it should also provide 1 A for one hour, right? Not quite, because capacity diminishes somewhat for high-current loads.

NiCds don't tolerate sustained overcharging, which causes dissociation of hydrogen and oxygen in the electrolyte and opening of the vent, drying out the cell. It may also cause the terminal voltage to drop to a plateau of about 1.1 volts early in the next discharge cycle. When that happens, the effect is often mistakenly termed "memory." On the other hand, true memory, brought on by repeated shallow discharges to the

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$60 (includes one additional person, N/C). Some features are: dealers, factory reps, seminars, VE exams, and DXCC field checking. Contact *Warren Kelsey, S. 1405 Crestline, Spokane WA 99203. Tel. (509) 534-8443.* Make checks payable to *Lilac City ARC.* Talk-in on 146.52 simplex and 147.32 rptr.

APR 10, 14

ST. LOUIS COUNTY, MO SKYWARN will offer all-day classes Sat. April 10th, with Level 1 training in the morning and Level 2 training in the afternoon. Level 1 classes will also be held the evening of April 14th. For locations, call the *Severe Weather Info Line at (314) 889-2857,* for a taped message and additional info. R.A.C.E.S. and SKYWARN certification is provided at no cost. Everyone is welcome. Training is sponsored by the St. Louis County Police, Office of Emergency Management.

APR 11

RALEIGH, NC The Raleigh ARS will present its 27th Hamfest and Computer Fair in the Jim Graham Building, NCS Fairgrounds, Sun. April 11th, 8 a.m.–4 p.m. Wheelchair access. There will be ARRL, MARS, APRS, ARES, NTS, QRP and DX meetings. Advance tickets $5, $6 at the door. All activities inside. Tables and booths avail. Free parking, RVs welcome. Hospitality party Sat. night. VE exams, W4VFJ, (919) 556-8551; pre-register. Direct inquiries to *Wilbur Goss WD4RDT, 4425 Watkins Rd., Raleigh NC 27616; (919) 266-7883.* Talk-in on 146.64/.04.

DELOIT, IA The Denison Repeater Assn. of Denison IA will host the 1999 Deloit Amateur Radio Swap Meet on Sun., April 11th, at the Deloit Community Buliding, 320 Maple St., Deloit IA. Doors will open at 7 a.m. Admission will be $2, tables for sellers will be $2. Tables may be reserved by contacting *John Amdor KD6MXL, (712) 388-8042; packet KD6MXL @WAØZQG.#WIA.IA; or E-mail [johnmxl@radiks.net].* Talk-in on the 147.090 rptr (+600). Info will be on the Web at *[http://www.radiks.net/~johnmxl/deloit.html].*

MONTGOMERY, NY The Orange County ARC will hold a hamfest, 8 a.m.–2 p.m., at the Valley Central High School, 1175 State Route 17K, in Montgomery. Take Interstate Rt. 84 to Exit 6 (Rt. 17K & Montgomery); take Rt. 17K west to the high school on the left-hand side. Admission is $5 in advance, $5 at the door. Tables $10 if provided by the club, or $8 if you bring your own. Tailgating space, weather permitting, is $7. Talk-in on 146.160/.760, 100 Hz PL tone. Contact *Edward J. Moskowitz N2XJI, 123 Harold Ave., Cornwall NY 12518-1701; (914) 534-3492. E-mail [N2XJI@BANET.NET] or [EMOSKOWITZ@BEAR.COM].* Check the Web at *[www.IDSI.NET/~MSHOVANI].*

SPECIAL EVENT STATIONS

MAR 27

MACON, GA The Macon ARC will operate W4BKM 1500–2300 UTC on Sat. Mar. 27th, at the 17th annual Cherry Blossom Festival in Macon GA. Phone: 7.235, 14.240 and 21.335; CW 7.135, 14.035 and 21.135. For a certificate, send your QSL and a 9 x 12 SASE to *Macon ARC, P.O. Box 4862, Macon GA 31208.*

APR 10–11

GREEN VALLEY, AZ The Green Valley ARC, N7GV, will operate 1800Z Apr. 10th–2100Z Apr. 11th, in the 8th annual commemoration of the closing of all Titan 2 missile sites. CW: 14.045, 28145. SSB: 7.272, 14.272, 21.372, 28.372. A certificate is available; send an SASE to *GVARC, 601 N. La Canada, Green Valley AZ 85614.*

same point in the discharge cycle, was a problem in early satellite batteries but is rare in today's cells.

Now imagine rechargeable batteries with double the energy density (capacity per unit of weight and volume) as NiCds, and no one ever uses the dreaded term "memory" when talking about them. They exist, and you can find them and their chargers at your local discount store. But are they a good choice for powering the fox for your club's next hidden transmitter hunt? What about other uses around the home and shack?

The lowly alkaline gets renewed

For radio use, ordinary alkaline batteries (primary cells) don't get much respect. Once discharged, they go into the trash. But for high energy density and long shelf life, it's hard to top them. They have higher internal resistance than NiCds, so they can't put out very high current. But for moderate current applications, they provide far more on-air time than NiCds of the same size. They have higher terminal voltage, and they weigh less, too. They aren't made with cadmium or mercury, so they are safe in landfills.

Rechargers for primary alkalines have been marketed, but haven't been successful because the recharging process usually causes shorts, gas buildup and leakage in them. Five years ago, Rayovac introduced Renewal® Reusable Alkaline™ batteries, which are especially designed to be recharged. I seldom hear of T-hunters using them, but they deserve a closer look for many RDF applications.

Unlike NiCds, which have about the same Ah ratings for all loads less than the one-hour current, the available energy of alkalines varies significantly with load and duration of use. The lower the current and longer the rest period between transmissions, the higher their capacity. Capacity per charge of rechargeable alkalines decreases with each use, eventually becoming so low that it's time to throw them away.

Here's a practical example with which to compare these battery choices. My ICOM IC-2AT in the low power mode (300 milliwatts) draws 200 mA at any operating voltage above 6.5 volts. The low-battery light comes on at 5.65 volts (0.95 volts/cell). A six-pack of AA Energizer® NiCds is rated at 650 mAh, providing about 13 hours of total hidden-T time for the IC-2AT, assuming a 15-seconds-on/45-seconds-off cycle and ignoring the receiver drain between transmissions. In the same setup, a six-pack of AA primary alkalines provides about 1950 mAh, three times as much. In the first cycle, you can expect 1200 mAh from a six-pack of Renewals. After 25 charge/discharge cycles, the NiCds and Renewals will each give about 650 mAh. At cycle 100, the Renewals will be down to about 450 mAh, still enough to put on a nine-hour T-hunt.

At a local discount store, a package of four AA-size Renewals costs about $6.50, compared to $2.75 for non-rechargeable Rayovac alkalines. The two most famous brands of primary cells cost a bit more. (They have to pay for all those bunny and anti-bunny ads somehow.) Energizer NiCds cost $9 for four.

If the Renewals are thrown away after 100 cycles in the above example, they will have provided a total of 1200 hours hunt time (0.8 cents per hour), compared to 1300 hours for NiCds (1.0 cent/hr). Primary alkalines cost 3.8 cents/hr for their single cycle of 39 hours.

At lower currents, Renewals perform even better. A 75-milliwatt micro-transmitter drawing 50 mA from a three-cell pack (above 1.1 volts per cell) should get 1700 mAh from them on the first cycle. After 100 cycles, capacity drops to 600 mAh.

A different charger

The chemistry of alkaline batteries mandates a special charging system. NiCds and lead-acids are readily charged with continuous or pulsed current. The endpoint of their charge cycle is sensed by measuring the terminal voltage while current is being applied, sometimes augmented by current slope and/or temperature sensors. The higher internal resistance of alkaline batteries makes it impossible to properly sense the end-of-charge point that way. Terminal voltage must be measured between pulses of charging current.

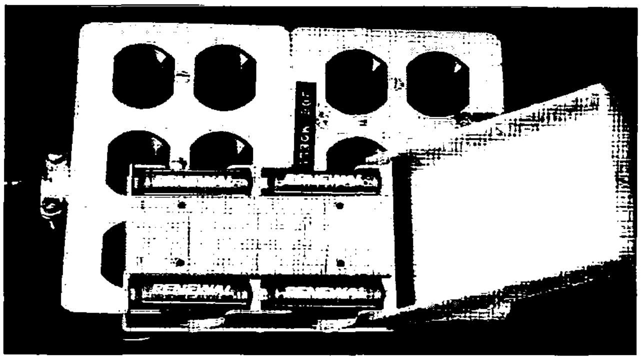

Photo A. This Renewal charger refreshes four AA or AAA batteries at once. Each cell is separately monitored.

Although you could build your own charger, it is probably not economically advantageous, since a Renewal four-cell (AA or AAA) charger costs only about $10 at a discount store (**Photo A**). It's actually four chargers in one, because each cell holder has its own charge, sense and shutdown circuits. (Unlike other rechargeables, Renewals can't be successfully charged in a series string.) Smart electronics inhibit charging if a cell is completely dead or inserted backwards. A special holder and connectors prevent it from charging primary alkalines. (Renewals have a unique top design with a larger positive terminal area.)

For experimenters wanting to build a Renewal charger into a home-brew project, special ICs are available from Benchmarq Microelectronics of Dallas that support multiple cells, regulate the current pulses for charging, and include a charge rate sensor to detect charge completion. Incidentally, Benchmarq's line of battery-management ICs includes chargers and "gas gauge" sensors for all types of batteries. Some chips communicate with the host microprocessor in the using device to support an easy-to-understand "time remaining" display in hours and minutes. Which ham radio handie-talkie manufacturer will be the first to implement this feature?

Renewals are not suited for very high current loads due to their higher internal resistance. NiCds would be better in your handie-talkie if you run high power most of the time. Renewals are also not suited for devices in which the battery will be drained to near exhaustion, such as flashlights and clocks. Make sure that you stop using a Renewal-powered device as soon as the LOW BATTERY indicator appears.

For me, Renewals really shine when used in products that require near-maximum voltage for proper operation. These devices often appear to be "battery hogs" because they stop functioning or indicate low battery even though there is plenty of life in the cells, albeit at reduced voltage. For instance, the flash pack on my 35 mm camera uses four AA cells. When they are fresh (1.6 V/cell), the flash recycles in a few seconds. But after shooting a roll or two of film, it seems to take forever, even though the batteries are only down to 1.35 volts per cell.

For shooting fast-paced nighttime foxhunting action, I used to throw away perfectly good

Number 44 on your Feedback card

QRP

Low Power Operation

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This time of the year at my house, we're usually up to our knees in snow. So, depending on where you are, you may be suffering from a case of cabin fever. I know of no better cure for cabin fever than building something for the shack. It's not a case of deciding what to build—it's just that the act of melting solder can often make you feel better.

However, if your supply of future projects has hit bottom, how about working on designing your own PC boards? You know, nowadays, it's just not possible to really perfboard everything together. Usually, any circuit that requires more than one 14-pin IC is enough to make me stop thinking about building it, unless a PC board is available.

When I had just received my license, one of the local hams had built a two-meter HT from scratch! Sure, it was not very pretty, but it *did* work. Of course, back then we had only one repeater in the county, and almost everyone was on 146.52 simplex. What really got my attention was that Joe made his own PC boards. Now, you have to remember that this was way, way back in 1975, and a computer in the shack was still the stuff of science fiction! No, what Joe did was to build his board out of double-sided PC board material using nail polish, hobby paint, and mailing labels!

Well, that was then; this is now. Today, we have several methods of putting circuits on PC boards. Let's look at some, from the easy ones to computer-generated Gerber files.

Since Joe's rig did not include any large-scale multi-pin ICs, he had a lot more room to put in his traces. Also, Joe was able to build the HT large enough to suit the capacity of his drawing ability.

In making a PC board, the idea is quite basic. You apply some type of resistant coating to protect the copperclad board from the etching chemical. In Joe's case, he used nail polish. Joe applied the nail polish using a very fine camel hair brush—and a very, very steady hand! Where Joe wanted a copper trace, he put down the nail polish. When the board was etched, the only copper to remain was protected by the polish. A bath in acetone removed the polish. The holes were drilled as required, and the parts mounted on the board. An almost-instant PC board was made.

Almost-instant PC board? Well, that's right! You see, etching

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batteries and put fresh ones in the flash unit, just to get fast recycle time. Putting NiCd cells in place of alkalines wouldn't solve the problem, because the terminal value of NiCds is only 1.35 volts each when freshly recharged, dropping to 1.2 V soon after. So now I just carry a couple of sets of rechargeable alkalines. After every session, I charge them back to 1.6 volts so they're ready to go.

Similarly, I use Renewals in the Sony portable shortwave receiver that I take on occasional overseas trips. I also carry them for backup use in my VHF handhelds. I don't have to worry about self-discharge in the camera bag, suitcase, and emergency box between times of need.

Some manufacturers recommend fully discharging your NiCd batteries regularly. Don't do that with your rechargeable alkalines. They last longest if they are not discharged below 0.9 to 1.1 volts per cell, depending on load. That's what makes them ideal for the camera flash, where they will not be used below 1.3 volts.

Renewal batteries are available in sizes AAA through D. Because each cell must be charged individually, multi-cell batteries such as the popular NEDA 1604 9 V package are not available. For more information on Renewals, download the application notes and product data sheets from the Rayovac Web site [http://www.rayovac.com/oem/]. You can compare them with non-rechargeable alkalines by downloading Rayovac's primary battery application notes at the same site.

Ready to roll?

If a spurious signal appeared on your local repeater input frequency tomorrow, would you be ready to track it down? Members of the Hudson Valley Direction Finding Association were quick to respond when it happened to a repeater in Nyack, New York. "We did it by the textbook," wrote Tony Cioffi N2KI. When he and John Hirth W2KI got the call one morning, they went to the repeater site to get good bearings on the signal, which was quite unstable.

"We then headed out to another location that would give us an intersecting bearing," N2KI went on. "With this info, we headed into New Jersey, where the bearing lines intersected. All the way, we had different signal strengths and at some points, nothing. What made it a lot harder was that the signal was drifting about 50 kHz. We had to keep scanning the band for it. As we got closer, we added more attenuation."

Before long, they were over 10 miles away at Beth El Cemetery in Paramus, New Jersey, where the signal was a solid S-9. "At 12 noon, it disappeared as if someone threw the switch," Tony continued. "Great, just as we finally get close, it goes away! So we went for lunch."

Luckily, the signal was back when they finished eating. "After walking around for a while and getting more readings, the work force was wondering what we were doing. When we explained, they were very considerate. We were able to check their business frequency to see if it had a connection to the spur. No such luck."

The intrepid pair kept tuning and taking bearings. Soon they were in a police parking lot, with Bergen Pines County Hospital in view on the other side of the Garden State Parkway. "At this point, we had over 100 dB of attenuation. We couldn't get good directivity with the quads, or even with an antennaless handie-talkie. So John broke out his SuperDF, a Time-Difference-Of-Arrival set by BMG Engineering."

A few minutes later, they were certain that the spur source was within the hospital. They called the repeater trustee with the news. "After six hours, we had our culprit," Tony concluded. "Within 24 hours, the spur was fixed. We never did find out what equipment was causing it, but our repeater is now back to normal. It's really satisfying to be able to use RDF skills in a real situation and have positive results."

Unfortunately, grunge-busting isn't always that straightforward. It takes perseverance, logic, and luck to solve "tough dog" cases, even for experienced T-hunters. Next time, I'll tell the story of a hunt that didn't go as well. The lessons learned may help you if similar problems strike in your home town.

the copper from the board is the easy part. It's figuring out how to lay out the circuit that's the kicker! Circuit Layout 101. Here's how I do it, and believe me, for every ham you talk to about laying out PC boards, you'll get a different method. This is what works for me. By the way, we're talking hand-made right now—we'll look at computer-generated PC boards next time.

One of the first things you need is a pair of X-ray eyes. You need to have the ability to visualize looking through the PC board just like Superman would. By the way, this is exactly how the computer does PC display, by looking through the board.

I start by assembling all the major parts needed for the project. This includes the ICs and other larger parts like the electrolytic capacitors. If any oddball-shaped parts are used, I make sure I have them in the pile.

I like to put the parts on a PC board so that all the input and output lines are on the end. This way, I can use one of the multi-pin connectors I like. I then place the parts, such as ICs, on a sheet of paper. I may move them around so that the connections between one IC and another are as short and direct as possible.

Once I get a feeling on how the major parts should be placed, I use an ink pen and draw in the IC pins. I mark pin one with a red pen. Now, using your schematic, you start by drawing in the resistors, capacitors, and whatnots in pencil. Using your pencil, you connect the various parts together, while not allowing any of the pencil marks to touch or cross each other.

You may be wondering why I use an ink pen for the sockets and pencil for the traces. Of course, you can erase the pencil marks, but the ink is permanent. That way I can change the traces going to and from the IC pins without redrawing them each time I make a change. I put in the resistor and capacitor leads the same way, provided I have decided to keep a part in its final position.

Believe me, you'll need to redraw the traces dozens of times before you're happy with the results. The general idea is to avoid the use of jumper wires. But, unless you're working on a double-sided board, you may not be able to avoid jumpers. The world won't come to an end if your circuit has some jumpers. In fact, I've seen some designs that used more jumpers than parts, but the circuits worked just fine!

I mark each component with its designator per the schematic. Resistors R1, R2, and so on, instead of 10 k, 1.2 k, and the like. That way, you know what part goes where. Things can get all screwed up if you have more than one 10 k resistor drawn on your sheet.

Normally, I run all the traces between all the pieces parts and then do the supply or VCC line. I run ground traces as I need them. Many parts require ground connections, so I try to daisy-chain these connections together.

After I get the paper version of the circuit down as well as I can, I make a photocopy of the layout. Now, I get some of the black foam they use for shipping static-sensitive components, and place my paper copy on top. Then I push the leads of the parts through the paper into the foam. This way, I have a real live full-scale model of the circuit board before I etch it. I do this step to be sure that all the parts fit! One of the problems I have is having a part that won't fit the finished PC board. This usually comes up as a heat sink or mounting screw. I forget the heat sink has fins, and the fins have a habit of getting in the way of another part. The nut used to hold the PC board to the chassis may touch a trace or a resistor lead in the final version of the PC board. These small things have a way of biting you in the butt!

Special design goals

When working with RF circuits, I try to keep all the trace lengths as short as possible. Lead inductance may cause your circuit to perform differently on a PC board than on a perfboard. The higher the frequency of the operating circuit, the greater the chances of troubles with a poor PC design.

Traces don't have to be straight or at right angles to each other. In some of my designs, I have made curved lines to get to the emitter of an RF amplifier. The use of large ground planes helps keep RF circuits happy. The more ground copper, the better the stability of the circuit.

Applying resist to the copper

For traces, a resist pen works fine. Radio Shack® sells these for a few bucks, but if you're into making your own PC boards, I suggest getting these pens from an office supply house. Office Max® and Staples® both carry the Sharpie® markers. Keep the caps on them when they are not in use. Exposure to the air will dry them out in a hurry! Putting in these large ground traces can prove messy. If you're using a resist pen, you'll run the pen dry before you get all the copper covered.

In a case like this, I have used several methods. One is to use nail polish. I really don't have the talent to apply this stuff in fine lines, but for large grounds, it works just fine. A trip to the local five and dime will yield dozens of nasty-colored cheap nail polishes. You'll need some acetone to clean up with and to clean your brushes.

If you don't want to mess with the nail polish, how about mailing labels? Yup! They work! Clean the copper you want to keep and then apply a mailing label. Burnish the label down using an old Bic® pen cap. Don't worry about the area you need to protect just yet. After you have the label burnished down, cut away any area you need with a sharp X-acto® knife. After you etch the board, you can rub off the label. You can make an entire PC board using mailing labels! Just cut the label where you want the etchant to remove the copper!

Iron-on PC boards

If there is a board you wish to make, and the layout is in a magazine, there is an easy way to make your own boards. You'll need something called a toner transfer system. Basically, you copy the layout from the magazine onto this special TTS paper. Then, using an iron, you iron the image onto your copper board. By soaking the paper in warm water, you remove the paper backing, leaving a toner resist on the copper. You then etch the board as you normally do.

I have to admit, I've never had much luck with this system. There are hams who swear by it, but for me, it's way too much hassle.

Etching 101

Speaking of etching, I use the etching chemical (ferric chloride) available from Radio Shack. There are others available, but this stuff works the best, and is easy to obtain from the "Shack" on a Saturday evening.

You can speed up the etching process by heating the etching chemical, but don't get too carried away. If you get the fluid too hot, there is a good chance that you will undercut the copper being protected by the resist. If you're using mailing labels, it is possible to have them wash out if the fluid is too hot. Try not to heat the etchant higher than 100 degrees F.

By the way, in case you've never used ferric chloride, it will stain everything it touches. Ferric chloride is really nasty stuff, so be careful when handling it. Use only glass or plastic to store or etch your boards in. I use an old Pyrex baking dish.

How strong the etching chemical is, how hot it is, and the amount of copper you wish to remove all factor into how long it will take to make your board. I have found that with warm etchant, and with constant

Number 46 on your Feedback card

THE DIGITAL PORT

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One of the hottest digital topics has turned out to be slow-scan television (SSTV). I think it is fascinating to send and receive a color image directly via HF ham radio over a distance ranging from a few hundred to several thousand miles *and* have it display with excellent clarity. Probably the reason I have observed so much interest is that it can be done for such a low cost.

I have written previous columns about getting on SSTV for less than $50, and this was an accurate assessment, because I had done it (twice—two different approaches). There are programs available from Pasokon and Silicon Pixels that are either shareware or freeware and if you have a fairly up-to-date computer, the rest is a piece of cake (usually).

I receive more correspondence on SSTV than on any other mode, and that sparks my personal enthusiasm. Not long ago, a piece of E-mail arrived from Roger N8XP, who had just purchased a brand-spanking-new ultra-high-speed computer and a BayPac BP-2M multimode modem, and was experiencing problems with both the JVFAX and the EZSSTV programs locking up the computer.

He explained that his computer came with Windows98™ and I formed an unmentionable notion based on something a few software people had told me a while back. I am still using Windows95™, so I wasn't sure what to tell him, but I feared we were about to learn a new incompatibility problem.

Just to be sure I covered all the bases, I expressed the thoughts above along with the observation that these programs must run in DOS and not a DOS window. That is, Windows must not be running and I gave more detail than necessary. Then I told him, if he was following the rules up to that point, to call the BayPac people to see if they knew of any problem concerning JVFAX being incompatible with Windows98, or to call John Langner WB2OSZ, the author of the Pasokon EZSSTV software.

A few days later, Roger replied with some very useful information to share. John Langner had informed him that some of the earlier versions of EZSSTV had problems and those earlier versions were still on many bulletin boards. However, the version on the official Pasokon site (see **Table 1**) is the latest update. Roger downloaded that one and it solved the problem.

That is the lesson I wish to pass on. The listing in **Table 1** is the correct site to download EZSSTV. This is a very informative site and John frequently updates the data, along with interesting images including, at this writing, some pictures transmitted by the *MIR* cosmonauts.

As a little side-thought, I recall having trouble with the JVFAX program a year or so ago and that is when I started nosing around and found so many great slow-scan programs and hardware ideas available. It just took off from there. Also, in fairness, it looks as though the author of JVFAX now has a 32-bit version available. I haven't tried that one.

An SSTV organization

During one conversation with Bob W6EUZ, I was made aware of a fine non-profit SSTV group that puts out a newsletter and strives to advance the cause of slow-scan. The International Visual Communication Association, headquartered in Nashville, Tennessee, has a Web site. See **Table 1**.

I obtained some of their literature from Lew W6FVV. From that, I found the above Web site. It is really an education on the possibilities of SSTV—I mean possibilities that have already been attained. There are numerous images as received from *MIR* and a description of the equipment used on the orbiting spacecraft.

Included is a listing of those who have achieved various SSTV DX levels. One ham has confirmed 100 two-way image contacts and quite a few have recorded 50 countries. This gives an idea of the worldwide interest in slow-scan. There are also many related links that I didn't have the time to explore, but I would suggest there is a lot of education and motivation to get into this captivating mode.

The internet—friend or foe?

Along the way, I had a touch of reality hit me again. One of my teenage grandsons passed through the shack and I was showing him an image on the computer screen that was at that moment going out over the air. He looked at that for a few seconds, seemingly digested the thought, then asked, "Why don't you just send it over the Internet?"

At that moment, many unsettling thoughts flashed through my head. My answer didn't have much depth. I simply replied, "I don't want to. There is no challenge to that." Then I hoped I might reopen the question later when I could get my thoughts in order. But here lies a problem I have mentioned before.

This seeming "cookie-cutter technology" is so easy everyone is doing it. Those who are coming after us don't accept challenges very well. And I find the Internet, by whatever means it has, is capturing the vision of our bright young people and they are not finding fascination with ham radio. I am unsure how to change this situation. I see established hams abandoning the hobby because they find more to their interest on the Internet.

I grant that the Internet is a great medium for information gathering, as is evidenced in this column. It is educational for those who are so inclined. It will become a big-time player in commerce in a few years. But I grow weary (bleary) of looking at fancy Web sites and sure don't care to enter chat rooms with a bunch of people who don't have a life. I would rather spend 15 minutes calling "CQ" with no response. If I conjure up the correct attitude, those 15 minutes are more productive and, at the same time, relaxing. Maybe I am the strange one.

That antenna

Last time around, I told of a

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agitation, it takes about 10 to 20 minutes to etch a small board (your mileage may vary). Check the progress by pulling the board up out of the etching chemical, and allowing any excess to drain back into the etching tray. If you still see copper, then continue to etch. As you near the end of the process, you will want to keep an eye out, as you don't want to undercut any traces. Or worse yet, etch away the traces you desire!

All you have to do now is wash the board off with water and drill out the holes. We'll pick up on how to do that next time.

home-brew mobile antenna I'd built for the side of our small RV. It started as a simple experiment and it works well, but there is something a bit too "magic" about it. I didn't give specific dimensions, and I am not going to, until I can master the theory of why it works so well.

In a nutshell, it resonates on 40, 20 and 15 meters (with no changes!) and, with the help of a good tuner, I can bring the SWR to or near 1:1 on all three bands. I am ecstatic about the success. I should "nail it," close the toolbox and go on to greater projects.

The strange part of this antenna came to light as I was attempting to tweak the resonant frequencies by changing the length of the whip. It was cut at an arbitrary 91 inches, so I lengthened it to an even 96 inches. The dip meter gave the same resonant frequency readings.

Well, I could accept that for a bit. The plan that day was to assemble a 72-inch whip to experiment with. With that installed, all the resonant frequencies were the same. That is, 7.1 MHz., 14.2, 21.2, about 35 and about 45 MHz. It got eerier as I progressed.

I had left the temporary taps in place so I could change the coil dimensions and no repositioning of the taps made any noteworthy difference in the dip meter readout. I hooked up the radio and found that the SWR was much the same with one whip as it was with the other.

I attempted some coil tap adjustment to lower SWR, to no avail. Either whip radiates a signal. For proof, I worked a ham in Maine for a few minutes on 20 SSB with the six-foot whip. There is never time to get a real benchmark-type comparison, but I attempted breaking into a net on 40 with the short whip and they weren't copying.

After a few tries, I unscrewed the whip to make the change to the longer one and proved that the whip was doing something because the received audio disappeared with no whip in place. That was somewhat of a relief because I was beginning to think I had built a loading system that used the metal body as a radiating element. With the longer whip in place, a 40-meter contact was easily established with a more local station and received a decent report.

This means several things

Number one: I have an operable mobile station that I can take down the road this next week and just plain enjoy. I have yet to mount the radio so it is accessible from the driver's seat, although I did take it for a spin with the radio in the passenger seat, and made a few mobile contacts. Not very sanitary, but fun. And I *do* have the material to make the mount.

Number two: I have quite a stack of antenna books here, but there are few theoretical articles on mobile antennas. I built the loading coil by modifying some dimensions given for a monoband mobile setup in one of these books. There were no formulas available there. I hope all mobile home-brews are not designed and assembled by the seat-of-the-pants method as was mine.

Number three: Since arriving at this state of success, I have convinced the budget department (XYL) that it is a good idea to invest in an automatic tuner. I am truly convinced there is a safety factor concerning the driving hazards of the mobile operator as well as for the finals in the transceiver.

The main thrust of this endeavor is to work HF digital modes away from home. To this point, I have only been able to use VHF, which is limiting. Although I understand there is two-meter SSTV, I have never experienced it. This next week, I will be away from home and will experiment with "new-found horizons."

Speaking of automatic tuners, I am going to give LDG Electronics a buzz and get one of

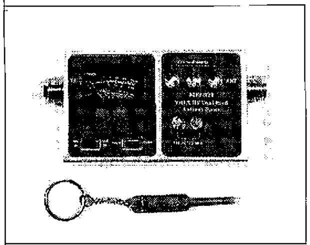
Continued on page 50

Current Web Addresses

Source for:	Web address (URL)
HF serial modem plans + software	http://www.accessone.com/~tmayhan/index.htm
PCFlexnet communications free programs	http://d10td.afthd.th-darmstadt.de/~flexnet/index.html
Tom Sailer's info on PCFlexnet	http://www.ife.ee.ethz.ch/~sailer/pcf/
SV2AGW free Win95 programs	http://www.forthnet.gr/sv2agw/
BayCom – German site	http://www.baycom.de/
Pasokon SSTV programs & hardware	http://www.ultranet.com/~sstv/lite.html
Winpack shareware for Windows	http://www.duckles.demon.co.uk/ham/wp.htm
Baycom 1.5 and Manual.zip in English	http://www.cs.wvu.edu/~acm/gopher/Software/baycom/
Source for BayPac BP-2M	http://www.tigertronics.com/
Tucson Amateur Packet Radio—where packet started—new modes on the way	http://www.tapr.org
TNC to radio wiring help	http://prairie.lakes.com/~medcalf/ztx/wire/
ChromaPIX & W95SSTV	http://www.siliconpixels.com/
Timewave DSP & former AEA prod	http://www.timewave.com
International Visual Communication Association—a non-profit organization dedicated to SSTV	http://www.mindspring.com/~sstv/
Small computer boards/various kits, including VHF packet serial modem kit	http://www.ldgelectronics.com

Number 48 on your Feedback card

NEW PRODUCTS

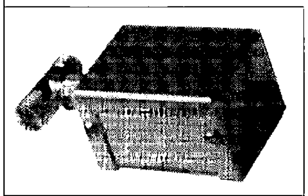


Barely Bigger Than a Matchbox

Try this one on for size—the MFJ-922 VHF/UHF dual-band antenna tuner! It has a single meter that reads SWR and power (no zero adjustment necessary). It covers VHF from 136 to 175 MHz and UHF from 420 to 460 MHz. You can read power up to 150 watts in two ranges: 60 W or 150 W.

The MFJ-922 is a terrific tuner for HTs, mobile rigs, or amplifiers up to 150 W. Tuck it in your shirt pocket and take it with you anywhere; an SWR tuning tool is included. Of, course, it's covered by MFJ's famous *No Matter What*™ one-year limited warranty.

To order or for the name of your nearest dealer, call (800) 647-1800; FAX (601) 323-6551; E-mail [mfj@mfjenterprises.com]; or check out dealer and ordering information on the Web at [http://www.mfjenterprises.com].

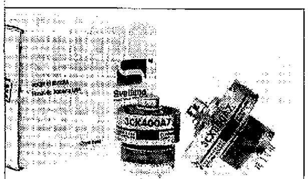


Protect Yourself from Mother Nature's Wrath

If you've ever had radio equipment damaged or destroyed by lightning surges, you probably remember how irate and frustrated you were. Dynamic Electronics, Inc., to the rescue!

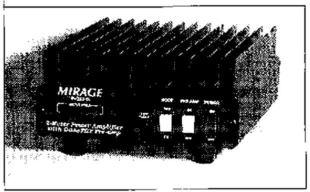
The new LP-1 Lightning Surge Protector is designed to place a short across the transceiver's antenna terminal when the transceiver is turned off. An SO-239 socket is mounted to a metal box and is connected to the normally closed relay contacts. A tee connects to the socket; the antenna connects to one side of the tee and a three-foot RG-58 cable connects from the other to the transceiver's antenna jack. An RCA-type phono jack is mounted to the box and a patch cord is included to connect to a 12-volt source.

The LP-1 comes complete with cables for a quick plug-in installation, and is only $39.95 plus $4.00 shipping/handling. Order from Dynamic Electronics, Inc., P.O. Box 896, Hartselle AL 35640; call (256) 773-2758; FAX (256) 773-7295; or check out their Web site at [http://www.hsv.tis.net/~dei].



Two New Triodes

Svetlana Electron Devices has just added two triodes to their line of high-quality Russian-made power tubes: the 3CX800A7 (available this summer) and 8874/3CX400A7 (available worldwide right now). For more information, contact Svetlana at 3000 Alpine Road, Portola Valley CA 94028, or call them at (650) 233-0429.

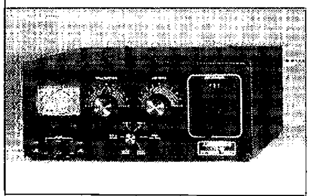


200 Watts Out from HT or Mobile

MIRAGE's new B-320-G, the *BruteFORCE*™ dual-purpose amp, gives you 200 watts of brutal power from your low-power HT or high-power mobile! It's two amps in one—a switch selects a 0.25 to 10 W hand-held amp or 10 to 50 W mobile amp.

The LED *PowerGraph*™ indicates output power and comes completely alive with 200 watts. It gives you all-mode FM/SSB/CW 2 meter operation. A low-noise 15 dB GaAsFET preamp lets you dig out really weak stations and can be used even if your B-320-G is off. The B-320-G has an on/off switch with a "power on" LED. It's super rugged and super compact, and comes with mounting brackets and rubber feet, and of course it's covered by MIRAGE's one-year warranty.

For your nearest dealer, call (800) 647-1800; FAX (601) 323-6551; or check out the Web site at [http://www.mirageamp.com].



Get Your Legal Limit

AMERITRON's new ATR-30, the True Legal Limit™ antenna tuner, allows sustained true RF output levels of over 1500 W continuous carrier into most load impedances. It also handles 3000 W continuous SSB, and CW duty, even on 160 meters, where most other antenna tuners fail. It easily handles the AL-1500, AMERITRON's highest-power amplifier.

The new high-Q, high-current, edge-wound silverplated roller inductor handles extreme voltages and currents without arcing or heating. The ATR-30 is loaded with features you'll flip over—the three-core choke balun, the illuminated cross-needle true-peak-reading SWR/wattmeter, and AMERITRON's superb one-year warranty, just to name a few!

For your nearest dealer or ordering information, check out the Web site at [http://www.ameritron.com]; otherwise, call (800) 647-1800 or FAX (601) 323-6551.

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Since 1956, CAIG Laboratories has been manufacturing high-quality electronics chemicals and soldering apparatus for electronic/electrical applications for all industries. They are constantly expanding their line of environmentally-safe products ... and as we all are aware, saving the environment is the only way to save ourselves!

CAIG Laboratories' new catalog features a variety of products to improve conductivity and maintain optimum signal quality on connectors, probes, switches, and other electrical contacts. Write for a copy of the catalog to CAIG Laboratories, 12200 Thatcher Court, Poway CA 92064; call them at (619) 486-8388; or visit the Web site [http://www.caig.com] for more information—and do your part to make our world a better place.

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Above & Beyond

VHF and Above Operation

C. L. Houghton WB6IGP
San Diego Microwave Group
6345 Badger Lake Ave.
San Diego CA 92119
[clhough@pacbell.net]

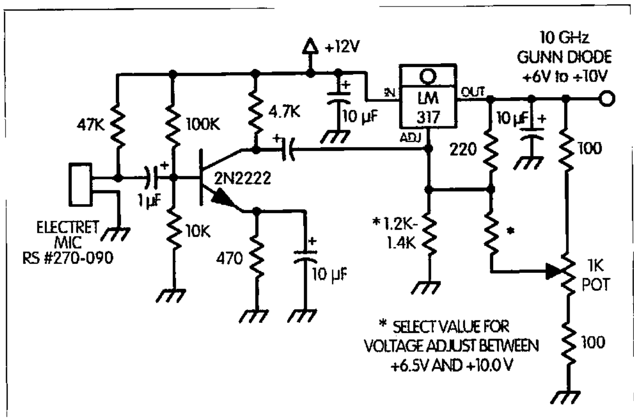

Fig. 1. Schematic for power supply modulator for 10 GHz Gunn diode source requiring +10 volts without varactor control. You must use an LM317 adjustable regulator for the circuit to function with modulation. A 7810 voltage regulator will not function as a regulator, having only in/out and ground, and no reference terminal.

10 GHz fun, 1999 update, part 2: the Gunn diode modulator power supply

Last time, we covered construction of the Ramsey FR-10 30 MHz FM IF system for our microwave transceivers for use on both 10 GHz and 24 GHz. This month, I want to complete the construction of the transceiver package, with discussion about the additional circuitry required in the transmitter portion of the system.

The power supply modulator in a wideband FM system is quite simple in that DC voltage is used to power a Gunn diode in a microwave cavity. The 24 GHz Gunn-varactor-controlled transceiver can be obtained from SHF Microwave Supply [arutz@shfmicro.com]; phone: (123) 456-789; FAX: (123) 456-789. The 30 MHz receiver was obtained from Ramsey Electronics, 793 Canning Parkway, Victor NY 14564; 1 (800) 446-2295 will get you the order desk for the FR-10 30 MHz receiver.

A little review is in order due to differences between 10 and 24 GHz Gunn oscillators. For 10 GHz, the Gunn voltage is in the 5 to 10 V range. Current requirements depend on the power output of the Gunn device. Ten milliwatt Gunn sources draw about 50 to 100 mA of current, while 100 mW devices can draw as much as 600 mA. 24 GHz Gunn diodes require lower voltages to function than the 10 GHz devices do. Nominal voltage for a 24 GHz Gunn device is in the 3 to 6 V range, with requirements similar to those of the 10 GHz devices with regard to power and current drawn.

The power supply/modulator for either circuit is quite the same. In each case, the power supply is constructed from a single LM317 adjustable voltage regulator. For systems that use a varactor diode, the Gunn diode voltage is set at a fixed value near its maximum voltage of around +5 V, depending on diode specifications for that particular diode. Then, to adjust frequency, another variable resistor varies voltage on the varactor to adjust frequency of operation.

The modulator mike amplifier of the circuit can be a single transistor or an op amp. In the case of varactor cavities, the mike amp is connected to the adjust terminal of the varactor regulator. Audio from the mike is a small-value AC component now riding on the regulator adjust terminal of the variable voltage regulator.

When the mike audio (a small-value AC voltage) is added to the fixed DC voltage on the regulator, it causes the output voltage to vary at the audio rate, producing a change in frequency varying at the audio rate. This produces FM (frequency modulation) on the transmit signal. The amount of

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The Digital Port

continued from page 47

their kits. They were the ones who supplied the hard-to-get packet serial modem kit that I wrote about some months back and they have a reasonably priced tuner in kit form, or it can be purchased assembled. Their Web site is also listed in **Table 1**.

I see that the packet serial modem has been removed from their new Web site. It could be (though I doubt it seriously) that when I wrote about this wonderful packet modem that you folks simply cleaned them out and that was the last of the inventory. More likely, it was such a small item and was a bit temperamental and possibly required more technical service replies than the profit could cover. The market has passed away on this item. There are a number of reasons as I discussed in a previous column.

Anyway, there are eight items listed and you might want to take a look. In addition to the regular tuner I intend to order there is a low-current-draw QRP tuner, two small computer boards for special control projects, relays to work with the computers, a repeater voting system, a balun kit and a nifty-looking headphone/speaker box to use between the output of your radio and your computer speakers.

One more item that looks like a winner comes from Timewave, the folks who absorbed AEA. They already build a whale of a great DSP unit, the DSP-599zx (which is a must-install for the mobile installation here), that works very well when coupled with the old iron-horse AEA PK-232, and a great RTTY program to use directly with the modem in the DSP-599zx.

Now they have developed something unique just for the PK-232. They offer a DSP upgrade that works in all modes, including RTTY, PACTOR, CW and packet. This makes it possible to have excellent DSP performance for the PK-232 for 125 or 150 dollars depending on whether there is already a daughterboard in place. You can read about it on their Web site (see **Table 1**).

I had a recent E-mail asking where to purchase a PK-232. I replied that I had seen a number of used ones on the market in the $100 range. I might also mention that if you look quickly, there may still be a closeout special from Timewave on the DSP-232 Multimode for $100 listed on their Web site. I have had my PK-232MBX for so long that I wouldn't consider trading it, but that new $100 multimode would sound good to someone who has none.

If you have questions or comments about this column, E-mail me at [jheller@sierra.net] and/or CompuServe [72130,1352]. I will gladly share what I know or find a resource for you. For now, 73, Jack KB7NO.

audio when increased affects the deviation of the transmitter FM. The audio voltage (very small AC voltage) rides on top of the DC varactor control voltage that is used to set the RF frequency of operation.

Quite a simple scheme, mike audio to FM in a voltage regulator circuit. In the Gunn diode without varactor frequency control, the audio is connected to the Gunn diode voltage regulator adjust terminal to function much the same as in the varactor scenario. The non-varactor cavity setup is hampered with less frequency agility than varactor cavities allow. Frequency agility is quite good with varactor cavities, making them more expensive and desirable. In any event, both work—it's just that the varactor cavity is like a Lincoln in comparison with an economy car. See **Fig. 1** for the power supply modulator circuit for a basic Gunn oscillator cavity without varactor control.

A simple circuit uses a single 2N2222 NPN transistor for the audio amplifier mike amp, as shown in **Fig. 2**. The LM317 circuit is similar for all applications, whether with 10 or 24 GHz Gunn sources. The only differing factor is the voltage required for the Gunn diode—approximately 10 volts for a 10 GHz diode and a value of about five volts for a 24 GHz diode.

With most systems operating from +12 volts DC, a direct connection to the LM317 will be sufficient, with a modest heat sink to dissipate heat. For higher-current operation for high-current diodes, use a bootstrapping NPN pass transistor to increase the regulator's current handling ability. Almost any NPN transistor will work. I used a TO-220-case 2N3055, as it was in my junk box. Any modest current device with work, too. Use an insulating mount to secure the transistor to a chassis, as the back of the device is the collector and needs to be insulated on the heat sink. See **Fig. 4** for circuit details.

Bypass the emitter of the NPN pass transistor with a 10 µF or more cap (value not critical) to minimize noise on the DC line from the regulator. By looking on a scope, I found that at this emitter output point I had quite an AC oscillation when the regulator was combined. I eliminated the oscillation with a 40 µF capacitor between the emitter of the 2N3055 and ground. I just grabbed the first tantalum out of the junk box—I suspect that a 10 µF would work just as well.

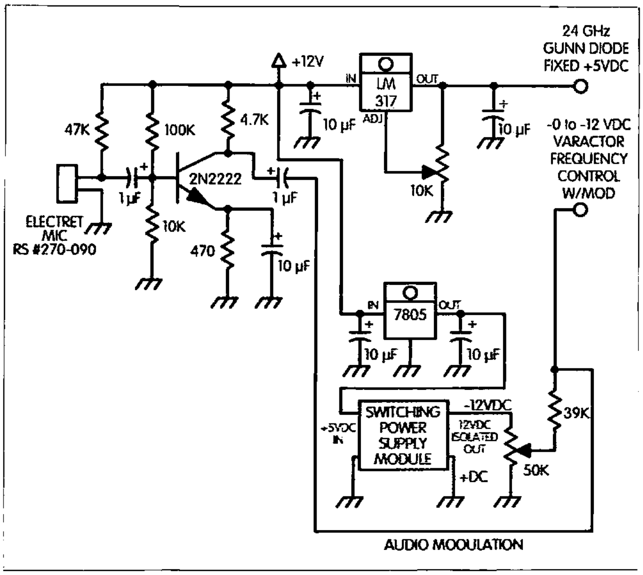

Fig. 3. Schematic changes when using 24 GHz Gunn diode source and varactor tuning arrangements. Note that on the 24 GHz cavity the varactor uses a negative voltage for control of frequency adjustment. Gunn diode voltage must be reduced to the required 5 to 6 V range. Verify your diode's maximum voltage before applying power. Note the addition of a small isolated switching PC-board-mount power supply added to obtain the inverted negative output for varactor tuning voltage. The power supply can be very small, as current required is less than 1 mA.

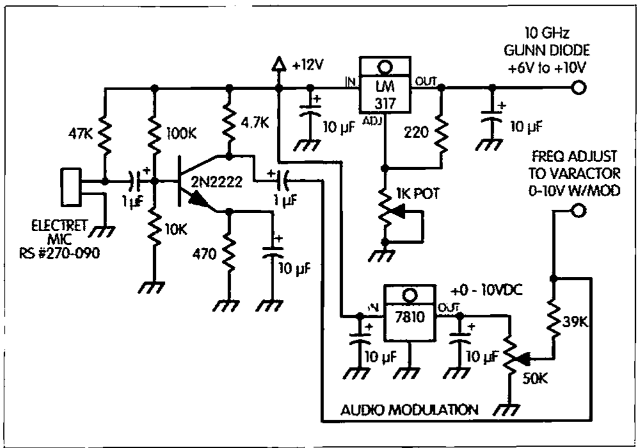

Fig. 2. 10 GHz schematic changes for varactor control mike audio applied to varactor for FM modulation. Audio voltage is superimposed on top of varactor DC control voltage that is used for frequency tuning. The LM317 could be replaced here by a fixed 7810 voltage regulator and used for both Gunn and varactor supply. Two regulators are used in this example for demonstration purposes.

Check out the power supply modulator using a basic scope if you have one. Look at the DC voltage output and set the LM317 up for whatever voltage is required—in the case of our varactor-controlled 10 GHz system, this will be +10 volts nonvariable. The varactor is driven with a positive voltage and is DC-adjustable from zero to +12 volts. Verify voltage operation and then use the scope to verify modulation on the AC-coupled scope. A few millivolts is all that is required of AC modulation superimposed on the varactor DC voltage for proper FM modulation.

In operation with the completed system, check all your power supply connections and voltage requirements twice before you connect up the wrong polarity or wrong voltage to the precious Gunn diode and its associated detector diode. The diode can be bypassed with both a small- and large-value capacitor to lower frequency oscillations. You will find that 0.001 and 10 µF capacitors will do just fine.

The detector diode needs a DC return to draw a little current to bias it slightly on. Most any value small RF choke near 30 µH or so will suffice. Run shielded leads to both the Gunn and detector diodes. I used miniature coax (RG-174) that was

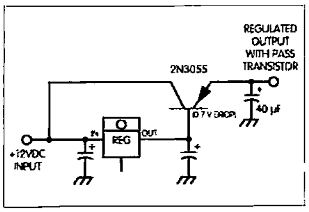

Fig. 4. Bootstrap 2N3055 or similar NPN pass transistor is added to voltage regulator circuit to increase current handling capabilities of voltage regulator. Note: There will be a 0.7 volt drop in regulated voltage out of the regulator due to voltage drop in the base emitter of the pass transistor. Set voltage regulator slightly higher to overcome voltage drop in use.

about one-eighth of an inch in diameter. Coax type is not critical; it's just required for shielding to prevent stray pickup.

Again, I stress: Use different connectors for the connections to feed voltage and detection, to prevent making connections to the wrong lead. If you, for instance, put the detector diode into the 10-volt source, it will destroy the costly detector diode. Use different connectors and you can't make an error in connections.

The detector diode connection is made directly to the 30 MHz input of the Ramsey FR-10 receiver. With the modifications described last month, the receiver should tune over a 400 kHz range of frequencies, making 30 MHz exactly the center of tuning. Normally, you will not have to make any receiver adjustment in frequency. For other stations that might be slightly off-frequency from 30 MHz, you may need to adjust slightly for received clarity.

Operation on microwave is full duplex, just like talking on a telephone. With simple horn antennas, you can communicate over many miles, depending on terrain and path conditions. By adding a small (12 inches in diameter) dish antenna, you can increase available gain by 28 dB (vs. a small horn, whose gain is about 12 dB). Quite an increase in gain with such a small dish antenna. The same comparison is true for 24 GHz operation. However, a one-foot dish at 24 GHz would have about 35 dB of gain because of its smaller wavelength. As frequency increases, wavelength becomes smaller, and you get more gain for the same area than at lower frequencies. Of course, that's for a dish antenna optimized at frequency.

Well, there you go. The package of the Ramsey FR-10 receiver and the transmitter modulator power supply control circuits should get you on the air with simple wideband FM operation. I tested my circuits using the Ramsey receiver, which proved quite sensitive and of great quality. The frequency I used was 24 GHz, because I knew from past experience that if it worked here it will perform on 10 GHz just as well.

Why pick 24 GHz for a test?

We wanted to complete project testing in time for participation in the ARRL 10 GHz and up contest. I used my 10 GHz narrowband station at home and made several contacts, but I really wanted to try 24 GHz for pure fun and to see if both Kerry N6IZW and I could get operational. I constructed and modified the receivers and obtained some small medical receivers to use for a shielded housing after removing all junk from the cabinet except the fuse and on/off switch. A simple conversion of the cases sure beat the prices of new metal cabinets (hams are frugal at times).

Kerry N6IZW constructed the modulator power supplies, and one evening two days prior to the contest we sat down, bench-tested both units, and got them operational. Kerry fashioned his 10 GHz dish with a small C-clamp, to fix the 24 GHz diode assembly near focus, and that allowed him to obtain quite a bit of gain in his system, possibly as much as 45 dB. I did not have time to haul out the dish feed due to commitment to our grandson's soccer game that Saturday morning, so I used a simple miniature horn antenna less than an inch in area for my antenna. Still, I made contact with Kerry over a short test range of about two to three miles, from Mt. Helix to Kerry's front yard.

Then Kerry and I met on top of Mt. Helix and communicated with Ed W6OYJ again on 24 GHz wideband FM. He was on top of San Miguel, where there are several television stations and FM radio stations, besides commercial FM repeaters—all co-located near his operation point. We made contact on 24 GHz, but signals were so strong from an interference point that Ed's S-meter was pinned, with or without 24 GHz signals. Both Kerry and I were able to hear sync buzz from the very powerful video UHF transmitter, even at some 12 miles distance. All in all, it made for a very interesting day and lots of enjoyment.

In retrospect, I can't give enough praise to the Ramsey FR-10 receiver. It delivered in many areas, including the most important one, cost. It is very inexpensive at $35, and outperforms similar systems. It comes with all component parts, a quality PC board, and easy assembly instructions. In field tests that we ran, it proved to be a very important player, and worked far better than I had hoped. If you haven't picked one up yet, do so if you intend at all to get on wideband FM. You should not pass up this fine bargain.

Next time, I want to get into the test equipment that was constructed to allow our testing at 24 GHz. I will bet your work bench is in the same boat mine was, with nothing above 18 GHz in the testing arena. Well, my old 8551 20-year-old (or older) spectrum analyzer goes to blue light with external mixers, but in reality, it's not very good with regard to what it sees. Next time we'll describe what circuitry was assembled to do quality testing at 24 GHz. The approach is not limited to only this frequency but can be applied to others as well—even lower ones—depending on your testing needs.

The main ingredient needed is a spectrum analyzer that can cover up to a GHz or so. We'll let you in on the plot next month and describe what we came up with. 73 for now, Chuck WB6IGP.

If you're a No-Code Tech, and you're having fun operating, tell us about it! Other No-Code Techs will enjoy reading about your adventures in ham radio—and we'll pay you for your articles. Yes, lots of nice clear photos, please. Call Joyce Sawtelle at 800-274-7373 to get a copy of "How to Write for *73* Magazine."

HAMSATS

Amateur Radio Via Satellites

Andy MacAllister W5ACM
14714 Knights Way Drive
Houston TX 77083

On November 3, 1997, cosmonaut Pavel Vinogradov hand-launched *Sputnik 40*, during a spacewalk, from the *MIR* space station. This three-kg amateur-radio satellite was built by students at the Jules Reydellet College in St. Denis on Reunion Island and the Polytechnic Laboratory of Nalchik Kabardine in the Balker Republic (Russian Federation). AMSAT-France, L'Aeroclub of France, and the Russian Astronomical Federation also participated. The satellite was built to commemorate the 40th anniversary of the launch of *Sputnik 1* on October 4, 1957. The *Sputnik 40* transmitter sent a beeping tone on 145.820 MHz that represented the satellite's internal temperature. The lithium batteries kept *Sputnik 40* (also known as *RS-17*) on the air for about a month. Check the February 1998 "Hamsats" column for details.

Sputnik 41

They've done it again. On October 25, 1998, a Progress rocket carrying *Sputnik 41* and supplies for *MIR* was sent into space. On October 27, *Sputnik 41* was delivered, along with the supplies. During a spacewalk on November 10, *Sputnik 41* was hand-launched by cosmonaut Sergei Avdeyev. Just before launch, Gennady Padalka told Avdeyev to "toss it gently toward the moon." This latest amateur-radio satellite was a joint project of L'Aeroclub of France, the Russian Astronomical Federation, and AMSAT-France.

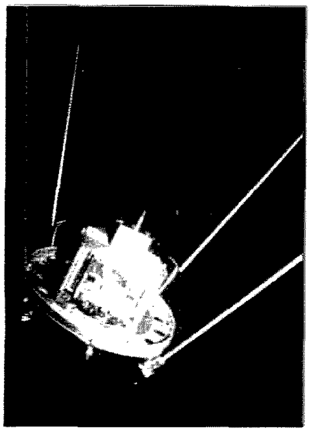

Photo A. Sputnik 41 *(RS-18) prior to launch (F6BVP photo).*

Unlike *Sputnik 40*, which simply sent its series of beeps, *Sputnik 41* was designed to broadcast prerecorded messages in addition to minimal telemetry data. The project began in March 1998, when Victor Kourilov (commissar of the Russian Aeronautical Federation and project leader for *Sputnik 40*) invited the French participants in the *Sputnik 40* project to build a new satellite celebrating "1998—The International Year of Air and Space."

The *Sputnik 41/RS-18* project had a very short fuse, even for a simplistic satellite. Seven months after the invitation to create a new *Sputnik*, the completed flight-ready device was to be aboard *MIR* and ready for launch. Gerard Auvray F6FAO, AMSAT-France's vice president of engineering, had an engineering model completed within a few months. By September 5, he had personally delivered the finished satellite to Moscow. Project financing came from L'Aeroclub of France in celebration of their 100th anniversary.

Sputnik 41 weighs less than 10 pounds (about four kg) and is a one-third scale replica of *Sputnik 1*. The new satellite is an eight-inch-diameter sphere with four swept-back antennas set for circular polarization. It transmitted 200 mW on 145.8125 MHz using FM while the internal batteries worked. The satellite was designed to function for one month. It did. The last signals from *Sputnik 41* were copied on December 11, 1998.

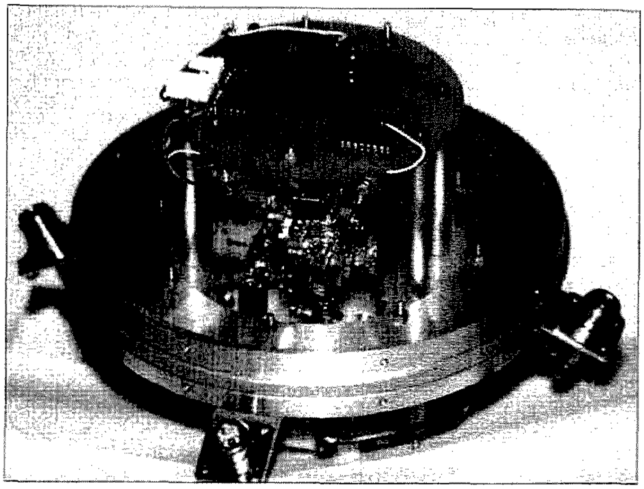

Photo B. RS-18 *system with voice module above and two-meter transmitter below (F6BVP photo).*

During its short life, the satellite sent two prerecorded voice messages in three languages, a recording of the beep signals from *Sputnik 1* in 1957, and its own audio tone sequence for satellite temperature determination. The onboard recorded message was stored in a 28-pin device from Information Storage Devices, Inc., capable of holding 90 seconds of good-quality (6.3 kHz sampling) monophonic audio. The transmitter was not keyed continuously, but only when a prerecorded, or telemetry, message was being sent. This helped conserve battery life, since there were no solar panels.

The first of the two messages sent by *Sputnik 41* was, "1998 was the International Year of Air and Space." It was read by Constantin Tsiolkvosky-Sambourov, the 14-year-old son of Sergej Sambourov RV3DR and great-grandson of Konstantin Tsiolkvosky, reputed inventor of manned rockets. The second message was, "International space school *Sputnik* program." It was read by Victor Kourilov, the project leader. The French and Russian versions of the two messages were read by other students and members of the design team.

The frequency of the tone signal sent by *Sputnik 41* between transmissions of the 90-second prerecorded segment was proportional to the satellite's internal temperature. A tone of 440 Hz corresponded to a temperature of -20 degrees Celsius, while a 1200 Hz tone represented +20 degrees Celsius. Check out the plot of audio frequency vs. temperature in **Photo D.**

Did you hear the signals from *Sputnik 41* during its short life in orbit? AMSAT-France is offering a QSL card confirming reception reports. Send your report to:

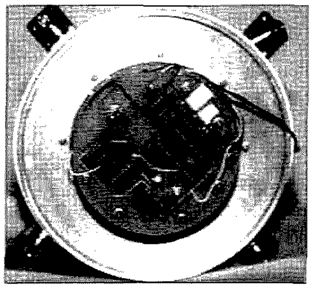

Photo C. *View of the voice module on* RS-18 *includes a 90-second memory chip and supporting circuitry.*

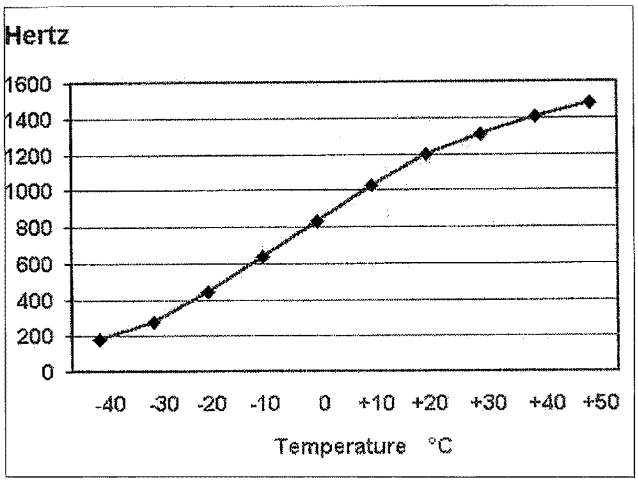

Photo D. *Plot of the audio frequency vs. temperature chart for the audio beeps from* RS-18 *(F6BVP photo).*

Photo F. *Gerard Auvray F6FAO with the* RS-17 *satellite prior to launch (F6BVP photo).*

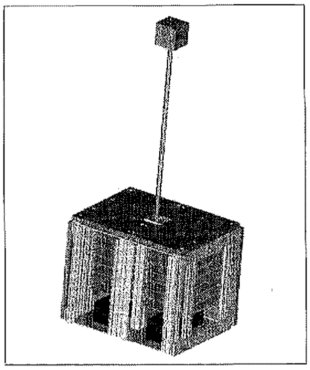

Photo H. Maelle *is larger and more complex than* SATEDU. *It is set for launch in 2001.*

AMSAT-France,
QSL Spoutnik 41,
14 bis rue des Gourlis,
F-92500 Rueil-Malmaison
FRANCE.

Send your QSL card or letter, along with two IRCs (International Reply Coupons) and a six-inch by nine-inch SAE (self-addressed envelope). Expect to pay $1.00 postage (over one-half, but less than one ounce) to get all of these items to France in your airmail envelope.

To find out more about the *Sputnik 40* and *41* satellites, check out Web pages by AMSAT-France President Bernard Pidoux on the Internet at [http://www.ccr.jussieu.fr/physio/sputnik41.html]. Useful links to AMSAT-France and other interesting sites are included in Bernard's pages.

But there's more ...

AMSAT-France and the other groups involved with *Sputnik 40* and *41* have more projects planned for 1999 and beyond. If you missed these two Phase-One-style (low orbit and short life) hamsats, there's another one coming this year. When *Sputnik 40* was sent to *MIR* in 1997, two electronics modules were sent. It is hoped that with a few more components, the backup system can be completed and released later this year from *MIR*. It will likely be called *Sputnik 42* or *RS-19*. It is also hoped that the new sputnik can be launched by Jean-Pierre Haignere during his visit to *MIR*.

SATEDU is slated for launch in 2000. It is a small educational satellite that includes a simple computer and various radio experiments. It will broadcast data, images, and possibly HTML (Hypertext Markup Language) pages on two meters at 400 baud. A move to 1200-baud AFSK on FM may occur before the design is finalized.

Maelle is a more serious digital communications satellite set for completion and launch in the year 2001. It is to be a low-earth-orbit satellite, but will be available for serious two-way digital communications using VHF, UHF, and SHF frequencies.

Don't miss the next *Sputnik/RS* hamsat. Listen to the AMSAT nets, and keep up with the news via AMSAT's Web site at: [http://www.amsat.org]. 73

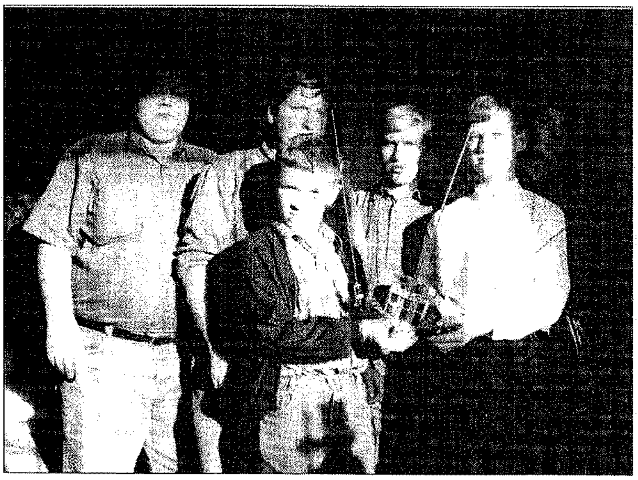

Photo E. *The* RS-17 *and* RS-18 *crew. Left to right and back to front: Victor Kourilov, Gerard Auvray, Sergej Sambourov, Constantin Sambourov, and Michael Sambourov (F6BVP photo).*

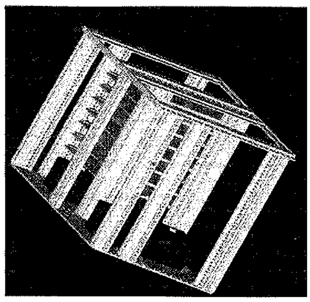

Photo G. SATEDU *is scheduled for launch in 2000.*

Number 54 on your Feedback card

UPDATES

Don't Fry Your Pot!

In "Mods for the OHR 100A," February 1999 issue, Fig. 3 on page 32 contains an important oversight. The 10k pot shown should be connected NOT to P100, which is the DC supply (!), but instead to P104.

Not VERVE, FFRF!

In Wayne's "Never Say Die" editorial in the January issue, he recommended a book called *In God We Trust*, a controversial examination of the Bible.

Somehow, in the last phases of putting the January issue together, the name of the company transmogrified from FFRF to VERVE. A number of interested people ordered the book, sending checks made out to VERVE, but the company's correct name is FFRF.

You can get a copy of the book from FFRF, Box 750, Madison WI 53701 for $12 ppd. 73

Enjoy CW Rag-Chewing

Some pointers for good — and fun — communicating.

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To have successful CW rag-chews, there are things you can do to make your transmissions more interesting for the operator at the other end and, most importantly, for yourself. Good SSB rag-chewing seems to come naturally; with CW and other modes it takes a little more finesse.

Start a good rag-chew by putting out information to the other operator which is interesting enough to produce an interesting reply. It may be something as simple as a few comments about the weather. If you can get other operators talking about themselves, you will usually get the ball rolling on an entertaining information exchange. A big help is to determine what the background or pastimes and hobbies are of the person at the other end of a QSO. You might start a QSO by briefly mentioning several things that you are in the process of doing, or have done, or expect to be doing in the near future. Always try to sign over with a question that requires an answer. This can help to start a QSO, or keep one going. If the other operator bites on any of your items or questions and comes up with a comment or answer, you may be on your way to an interesting gabfest.

Of major importance when rag-chewing on CW is to send neither too fast nor too slowly! Too fast and you lose the other operator—too slowly and you may bore him or her. The CQ you answer, or your CQ that is answered, plus the preliminary signal reports, QTH, and name information, will usually give you a good clue as to the speed at which you should send. Start your sending at the other operator's speed if it is not too fast for you. If you would rather be going faster, try increasing your speed a little each time it is turned over to you. When questions you ask are not being answered, you are probably sending too fast, so slow down a little. If the other operator is sending too fast for you or is making a lot of sending errors, don't be afraid to tell him or her to "QRS" (send more slowly) and you do the same. If you are sending faster than the other operator can read, he or she may try to increase the sending speed and make a mess out of their sending. Regardless of the speed at which the other operator is sending, never try to send at a speed which causes you to make errors. Poor sending results in short, ho-hum QSOs.

Be careful about using too many abbreviations on CW. If you know the other operator can handle abbreviations, go ahead and use them. Most newer amateurs today will not understand a lot of old-time landline abbreviations or others that are dreamed up by the other operator, which means that you may not be able to get your information across. The result will be a shortened and uninteresting QSO. There are quite a few abbreviations almost everyone will recognize and it does pay to use these. You will probably never get in trouble if you spell out most of your words. After all, you are not in a race—you only want to enjoy exchanging interesting topics of conversation with the other operator. A good rag-chew will normally require good operating skills, whether on CW, phone, or any other mode.

It is always best to use "break-in" or QSK when using CW, particularly with rag-chews—assuming your equipment can be operated that way. Some transceivers have a "VOX" switch which, if turned to "Fast" or "Full," will allow you to hear what is on your frequency in between your sending of CW dots and dashes, or if you take a breath on

SSB. ("Slow" or "semi" VOX is usually of no practical use on CW unless the code speed is extremely slow.) To reduce background receiver noises when using QSK, reducing your receiver RF gain may help. Different transceivers have different ways of allowing QSK to be used. If separate receivers and transmitters are used, it is usually necessary to use two relays, one to key the transmitter and another to change the antenna from receiver to transmitter. If you suddenly hear signals between dots and dashes while you are sending, stop and determine if it's the other operator breaking you to make a comment, or if it's another station moving in on you and who will be QRMing your QSO. In the latter case, it might be wise to QSY a kilohertz or so to an uncongested frequency.

It is imperative that you and the CW station you are working to be on the same frequency. If not, you are just asking to be QRMed. Consider this: The station you are talking to is sending on a frequency a few hundred hertz away from yours. While you are transmitting, the other station's frequency will appear unused to other amateurs and one may start operating on it. You can't blame that amateur. You and the station you are working are the ones at fault. You must always operate on the same frequency as the station you are working—you must be "zero-beat" with the other station. Be sure to learn how to zero-beat your transmitter to another station's transmitting frequency. This is one of the most important procedures for amateurs to learn. If you call CQ on one frequency and the answering station is either up or down in frequency from you, you can ask that station to move to your frequency (which gives him or her practice with zero-beating), or you can zero-beat the other station's frequency after advising of your move. Practice zero-beating until you can do it correctly and quickly. Actually, if you're within 50 Hz of an exact zero-beat that's usually good enough. If your transmitter is crystal-controlled and you cannot change your frequency, ask any station you contact to zero-beat your frequency. If another station tells you that his or her transmitter is crystal-controlled, you should zero-beat that frequency when you come back.

If your transceiver has an RIT (Receiver Incremental Tuning) control, make sure it is in the "off" position whenever tuning around! If RIT is detuned from its off position, it can cause a lot of difficulty on all modes of operation and usually results in your taking up more of the band than necessary. Also, when operating in a net, if your RIT is detuned a couple of hundred hertz it can require retuning of everybody else's receivers every time you start transmitting. On-frequency operations are particularly important for good rag-chews using any mode.

CW communications when QRN is high can be aided by using slower sending speeds. Unless keyer or bug dots can be adjusted to put out heavier than normal dots, it is often best to shift over to the old straight key whenever there is bad QRN or QRM. This may often result in extending an enjoyable rag-chew.

If the other amateur does not speak English well, be careful to use the simplest words you can that will convey your information. Don't abbreviate or use sophisticated or slang words when talking to foreign operators or they may not follow your meanings and will tend to sign off in short order. Information obtained from QSOs with foreign amateurs can be most interesting and informative.

When in communication with foreign amateurs, Q signals can be very useful, provided both parties are familiar with them. It might be smart to learn the meanings of the very few Q signals that might be applied to all types of communications on the ham bands and make a list of them to keep handy. Q signals have been in use on CW from the very early days.

It is rarely useful to do battle on the air over the use of a frequency. Sure, you may have been there first, but don't be a poor operator just because those who moved in on you showed that they were poor operators!

Proper use of the AGC control is important to make readability of signals add to a good rag-chew. Normally, FAST AGC works well for both CW and SSB. However, if you are copying a strong signal and weaker ones appear in the background, set the AGC to SLOW and the weaker signals will become much weaker and less annoying. Any strong static crashes will drive the AGC circuit's biasing voltage high, which will desensitize the receiver until the capacitor in the AGC circuit discharges. To overcome this, with strong QRN, turn off the AGC and use the RF gain control to set the receiver's sensitivity. You will miss fewer letters the other operator is sending. If you have a good noise limiter or blanker it may take out some of the peaks of static crashes. These operations can greatly improve the enjoyment of a good rag-chew when undesirable operating conditions are present.

A poor RST signal report has a tendency to make an operator give up on a QSO. The best rag-chews usually are between stations who are having little or no difficulty in hearing each other. But don't depend on S-meter readings too much. In many cases they are not true indications of the readability of the other signal. Basically, with no signal, your S-meter needle should lie at the zero point, or there should be no illumination of LED indicators (only possible if there is no background noise at your location). Theoretically, the weakest signal that can be heard should move the meter to the "S-1" point. A signal that is 6 dB stronger than that should read "S-2". A 6-dB increase is twice the voltage (or four times the power) input to your receiver, or will produce a one S-unit higher indication. The difference between any two S-units should always be 6 dB (assuming the manufacturer uses 6-dB S-units). If an operator tells you that he or she has increased power from 25 W to 100 W, but your S-meter does not show a one S-unit increase, your meter is not calibrated correctly for that band. Make tests like this with stations during a rag-chew and see what your results are. It can be quite interesting. When QSB is bad you may have to use peak S-signal values, taken over 30 seconds or so, for your test readings. Try it on each of the different

bands you use. Most transceivers today have variable power output with meters that can make these transmitting changes easily (hopefully these power meters are calibrated correctly!).

When the S-meter of a receiver is calibrated at the factory, a signal generator is used to produce the signal. Using signal generators, S-units may be made exactly 6 dB removed from the adjacent ones. But when we attach an antenna to a receiver the received signals may be quite different. Suppose a dipole is only 10 feet above ground and a certain signal produces an S-5 reading. If the antenna could be raised to 65 feet the reading might be S-6 or S-7, depending on the shielding by nearby trees, buildings, etc., as well as ground reflectivity. What is the correct S-meter reading? A beam will probably add at least one S-unit over what a dipole would produce. An S-5 signal at right angles to the wire of a dipole should normally read S-6 or higher with a beam at the same height.

In many cases, it can be beneficial for operators to resort to the old method of giving S-meter readings by using a calibrated ear. In the first three decades of ham radio there were no such things as S-meters. Signal strengths were all determined by how loud the signals sounded with the RF gain control (if the receiver had such a thing) set to some predetermined level. Practice listening to signals and judging their RST strengths before looking at your S-meter reading. You can become surprisingly accurate with a little practice. If you turn off the AGC and control the signal loudness by using the RF gain control, you can become quite accurate. On some bands it will be the only way to give reasonable "S-meter" ("S-by-ear"?) reports.

An interesting question comes up: If an S-meter varies up and down, what report should be given—the peak, the minimum, the average of the two? The one that will make the operator at the other end of a rag-chew feel best is the peak indication, and it is as good as any other. As the band changes, the S-meter peak readings will change. This can be an interesting item on which both the other operator and you can comment. Watch what your S-meter is doing and tell the other operator about it during the QSO. It should be an item of some interest.

After the RST, QTH, and name information is transmitted in a QSO, the usual items of interest to start with are the transceiver being used, its RF power output, and the antenna. If a transceiver is not used, describe the receiver and transmitter that are being used, the RF power output, and the type of antenna being used. Actually, your power output and antenna details are probably the most interesting things you can tell the other operator about your equipment. (In the old days the DC power input was usually given. If you only know your DC power input, about 60% of that will be an approximate RF power output. Most operators today can quote RF power output values because modern transmitters incorporate calibrated RF power output meters.)

In the early days of ham radio, the kind of transmitter, receiver, and antenna you were using would take a long time to describe in a QSO. No two stations had the same. Everything inside and outside the ham shack might be home-brewed, and many times with an ingenious use of parts never meant to be in a radio station. Today most equipment reports boil down to the listing of manufacturer names, numbers, and letters to signify what equipment is being used. Not too many amateurs today know the make-up of either their receiving or transmitting circuits, or even details about their antennas! A good modern rag-chew will probably have to include topics other than what your equipment consists of, or what home-brew equipment you are using.

Some subjects that I use as bait to get a good rag-chew going are listed below. You can probably add a lot of your own. While many of the items are given as statements, if you ask questions based on these statements you will usually receive a lot of interesting information.

•Age (at least for men).

Continued on page 58

Enjoy CW Rag-Chewing

continued from page 57

•Animals/birds you have, have had, or are seen in your area.

•Antenna being used, others available or being planned.

•Antenna difficulties, if living in a condo/restricted area (many sympathetic ears).

•Automobiles, RVs, boats, airplanes you have now, have had, problems with them, activities you have participated in or plan to be doing with them.

•Bands you like to use and why.

•Books/articles read lately, would like to write, or have written.

•Camera equipment, types of pictures you like to take.

•Computers you have and use in amateur operations.

•Difficulties with trees and other things around your property.

•Employment at present, previously, or expected in the future.

•Gardening you do, have done, or are going to do.

•Home repairing or building you have done, are doing, or will have to do.

•If you shipped out while in the service, interesting experiences, navy, merchant marine?

•Interesting experiences you have had on trips.

•Key being used: straight key, bug, sideswiper, electronic keyer, paddle, keyboard.

•Licenses other than radio: hunting, fishing, flying, handgun, etc.

•Marital status, number of kids, things spouse and kids do.

•Mobile radio equipment you use, have used, or plan to use.

•Modes you like to work: CW, SSB, FM, RTTY, AMTOR, packet, etc.

•Organizations: amateur, military, Masons, Odd Fellows, Elks, etc., that you belong to.

•Organized trips by boat, plane, or bus that you have taken or are planning to take.

•Other rigs and antennas you have and use.

•Radio equipment you are working on now or have recently built.

•Receiver details, superheterodyne, TRF, super-regenerative, bandwidth being used.

•Recent natural disasters in your area: fires, rain- or windstorms, cyclones, hurricanes, tornadoes, floods, earthquakes.

•Retired? From what? What you have done since retiring?

•Sports, such as archery, baseball, basketball, boating, bowling, fencing, fishing, flying model or real planes, football, golf, guns/pistols, hockey, horseshoes, hunting, ping pong, pool, skating, skiing, swimming, etc.

•Traffic handling systems in which you participate.

•Transmitter details, power output, power supply used.

•Try tests with the other amateur on antennas, transmitters, keying, modulation, etc.

•TV and VCR equipment you have and difficulties you have experienced with it.

•TV shows you enjoy watching, on standard channels, cable, or satellite.

•War duties, years, and experiences.

•Weather—always an excellent starting subject: temperatures, sunny, windy, foggy, rainy, snowing, sleeting, rainfall totals, snowfall totals, etc.

•What started you in the ham radio field.

•When licensed as an amateur/commercial operator.

If you can connect on only a couple of these subjects, you should be well along into an interesting rag-chew session. I can usually work a QSO into a rag-chew with someone who is not a DXer (and even some DXers at times), often a half-hour to an hour of some very interesting conversations. This is one of the things that ham radio should do for you: let you find out what the rest of the amateur world is doing and thinking. But don't be disappointed. There are some hams who are only interested in making short contacts, getting a signal report, maybe requesting a QSL card, and saying 73. With these people it may be useless to try to get much interesting information out of them. Once in a while, even with some of these CW operators, if you slow your sending sometimes you may get them to begin telling you something interesting if you happen to ask the right questions. Many CW hams who sound like they might be hotshots when sending (especially on KBs) but make a lot of mistakes may actually be very poor at copying hand-sent CW (as are their computers). It can be a challenge for you to see how much you can extract from such operators by slowing your sending. Sometimes a really interesting QSO results. Give it a try on the 30, 40, 80, or 160 meter bands. The other bands are usually used to work weaker, DX stations, which usually is not conducive to good rag-chewing. If you hook a rare one you hate to hold up other stations who are listening and want to contact that station. Any rag-chew you do make with almost any foreign station can be unusually interesting if you can manage to make it at off times.

One of the biggest but often most overlooked advantages of good CW rag-chews is the practice maintaining or improving operating skills, keeping the old fist in good operating condition, spelling out of your head, and using a card file to provide accurate recall of interesting items about other station operators. We should all try to improve our operating a little with each rag-chew. But by far, the best part of rag-chewing is that it can be a lot of fun—so give it a try! 73

NEVER SAY DIE

continued from page 5

will teach you how to develop your psi abilities. It's *The Psychic Paradigm*, ISBN 0-425-16509-5, 200 pp., 1998, from Berkeley Books, a division of Penguin-Putnam. Bevy is an excellent teacher.

America, SRO?

What about our immigration policies? Should we continue to let our borders leak like a sieve? Or should we get serious about upholding our laws against illegal immigration? On the one side I read that, heck, America is a huge country, with vast areas either unoccupied or underused. Also, that we have a need for a continuous source of people for low wage unskilled jobs. Let's consider those arguments.

If you've done much traveling, or even watched anything on TV besides ball games, sitcoms and Geraldo, you know why the unused parts of our country are unused. They're remote and do not offer an acceptable quality of life. Most of 'em are really lousy places to live.

The fact is that immigrants, with very few exceptions, head for our cities and, almost all of them being poor, they increase the slum areas of our cities. They contribute substantially to the crime rates, and their kids often get involved with street gangs. Just what we need — a steady source of more unskilled poor, growing slums, and more street gangs. More drug problems. More crime. More law enforcement expenses, even more clogged courts, and a growing need for ever more prisons. Remember, every inmate costs us about $30,000 a year to keep in prison, and that money comes out of your paycheck. And mine, dammit.

In my lifetime, the population of the country has about doubled. I've seen New York City gradually expand out to Long Island, where there used to be farms and now it's paved over with shopping malls and zillions of homes. The small towns of northern New Jersey have grown together, and the East Coast is basically one big city, reaching from New Hampshire to Washington DC. Megalopolis, we call it.

The immigrants are not moving to Idaho, Montana, or the Dakotas, they're going directly to where the money is, our cities. Hey, have you looked at a map of Southern California lately? Or Phoenix, Dallas, and Miami? How about Denver?

If we continue our almost open border policy, our city slums are going to continue to grow, pushing the more skilled people into what used to be the suburbs, and our spacious plains are going to continue to be as spacious as they were a hundred years ago. And, unless we force our politicians to wise up on their drug policies, we'll soon have two million people in prison instead of 1.2 million. Instead of our pockets being picked by Congress for $33 billion a year to keep these guys locked up, it'll be $60 billion.

Okay, how about all those unskilled jobs? Without a continuing source (mainly illegal immigrants) of unskilled workers, the shortage of people to fill these jobs would force the wages for this work upward, so it's the large number of unskilled workers that keeps wages low.

The fast food restaurants, for instance, which are so automated that they require a minimum of skilled workers, would start having to pay more and, as has happened in some areas where there is a serious low-skilled worker supply, start hiring seniors and providing them with some additional revenues to make the lives of those trying to get along on their Social Security payments a little less miserable.

Without immigrants, our population would be fairly stable. As people make more money they tend to have smaller families, so our population could eventually shrink some.

We've seen the continual loss of low-wage jobs as companies move these jobs to lower-wage countries. We've also seen a large loss of middle-class jobs through downsizing, made possible by low cost computer systems and improved communications systems. We really don't have a need for more unskilled workers. Our need is more for higher skilled and better educated workers. Don't get me started on our school system.

Maybe it's time to start closing the borders.

Advertising Basics

Unless you're working for a large company, the government or teaching, none of which will ever make you much money or give you much freedom, an understanding of the basics of advertising is going to be of value to you, so you'd better either cut this out and save it, or make a copy. Well, I threatened to write about this — and was forced into it by a letter from Douglas Diss VK2TDD of Tamworth, New South Wales. How could I disappoint an Aussie?

The easy part of marketing a new product is designing the product. Since most of you are coming at this from the engineering end, you tend to think that it's the product that's the most important, not the marketing. Wrongo. I've seen many superbly designed products bite the dust through lousy advertising, promotion and marketing.

These days, most ham products are being sold by mail order. In the old days, before the ARRL closed down 85% of the ham stores around the country, most ham products were sold through these stores — and they were just about everywhere. When I started *73* magazine in 1960, I soon had over 850 ham stores selling the magazine over their counters.

So, unless you are starting a really big company, you'll probably hire someone to do your advertising. Unfortunately, the odds are that this person isn't going to know squat about how to do it. They don't teach this in schools, you know. You have to learn by doing, but unless the person has had his own small business and learned the expensive, hard way, he isn't going to know what he's doing — a fact which I see clearly demonstrated as I flip through the ham magazine pages. Pathetic.

When I started my first company, the first thing I did was take a course in advertising. It was put on by the Advertising Club of New York and was superb. Since then, I've attended endless ad workshops and lectures, and I've been doing that for almost 50 years. Lately it's been more me lecturing.

Now, before I get into how to write

ads, let's go into how you should pick your ad medium. Advertising is going to be one of your major expenses, so you have to go about choosing your media carefully. Heck, you wouldn't buy supplies or parts from the first salesman that came along, would you? No, you'd ask for bids and look for suppliers who can provide the quality you need at the best price you can find.

If you start getting bids on your sales brochures or instruction manuals you'll be amazed at how wide a variation you'll find in bids. Some printers charge double or even triple what others do, and for the same quality of work.

Now, with advertising, you'll find yourself in a never-never land of unsubstantiated circulation and demographic claims. It's a jungle out there. Don't believe anyone. Period.

Here's my advice. I can put it in four words. Test, test, test, test.

If a magazine looks like it will reach your potential customers, rein in your ego and run a small ad. When you finally get around to reading books on advertising, and there are some good ones, you'll find that there is little correlation between ad size and sales response. Eventually you'll take whatever space you need to tell your sales story, but at first what you want to find out is which magazines are going to do the best job of selling your product. Make sense?

So, you run a small ad and keep track of the response. You want to know how many potential customers send for more information, how many order from the ad, and how many of those who get your sales literature eventually buy. As a simple rule of thumb, if an ad doesn't bring back at least 10 times the cost of the ad in sales, either your ad stinks or you're in the wrong magazine.

You may have a gangbusters product, but that doesn't mean that you're going to get much action from your first, or second, ad. Hardly anything is going to happen at first. That's the way it is.

When I started my Radio Bookshop in 1958, I ran a half-page ad for several books. I got four crummy orders. I thought I must have made a big mistake getting into that business. But, magazine deadlines being what they are, I'd had to agree to run the ad again before I'd found out what a turkey I had. The second ad pulled about 40 orders. Hmmm. So I continued advertising the same books. By the end of a year that ad was selling about 400 books a month! If I'd gone by the four sales the first month I'd have screwed up big time. As it is, here I am 41 years later and Radio Bookshop is still perking along as a viable business.

I'm not going to turn this into a book, so when I think of it I'll explain more. The sorry fact is that somewhere around 90% of the ads I see in the ham rags are in desperate need of someone who understands how to advertise. These guys are throwing away sales by the ton.

If you'd like to get a head start on this you could do worse than read a couple of books by Joe Sugarman W9IQO, one of the most successful mail order advertisers in history. There's his *Marketing Secrets of a Mail Order Maverick*, and his *Advertising Secrets of the Written Word*. Both books are worth their weight in palladium to you — and they're heavy! Damned heavy. They're both $40, and a steal. You can get them from Joe direct: JS&A, 3350 Palms Center Drive, Las Vegas NV 89103, or by phone at (800) 323-6400, FAX (702) 597-2002. And please say hello to Joe for me — he's been a good friend for many years.

LSD

An uptight reader (ALØFT) got all upset over my mentioning that I tried LSD back in 1960. A bad example for my kiddie readers (if there are any). Well, I didn't go into detail about it, not thinking anyone would be much interested. I was fortunate in that my guide through the experience was a ham who had been a good friend for over 10 years, and who had worked for me a few years before. He'd gone on to work with Timothy Leary, so he really knew what he was doing. He's still a good friend and we visit through the phone and AOL instant messaging.

Having been through it, I'd hate to think how terrible the experience could be without a first-rate guide. Somehow the LSD amplified my senses. Enormously. My senses of taste, hearing, feeling and seeing were multiplied a thousand times. It was incredible! It showed me what my body is capable of. I just wish I didn't have to take a drug to experience it. If I'd had any negative thoughts I suspect they, too, would have been amplified and could easily have caused me harm.

The experience was worthwhile for me, but my approach was as a researcher and scientist rather than someone out for a joyride. I did it, I'm glad, but I don't recommend it for others, and I'm not going to do it again. Been there, done that.

The same goes for pot. I had a fabulous pot experience back in 1948, so I know what it's like. I did alcohol in 1945, when I was in the navy and on liberty in San Francisco with my shipmates. We got drunk and had a great time doing it. We still talk about those nights at the Shamrock Bar at reunions in Mobile, where our old boat is on display for the public.

For some reason I don't seem to have an addictive bent, except maybe when it comes to Häagen Dasz coffee ice cream and crossword puzzles. So I like to try things and learn about them, but I don't get hooked.

When I travel I much prefer going to new places and seeing new things and people. A trip to Moscow? Nah, been there, done that. Paris? Ho-hum.

It's the same with ham radio. I've done repeaters, RTTY, slow-scan, packet, DXing, DXpeditions, 10 GHz, moonbounce, satellites, all of the contests, aurora bounce, building stuff, rag chewing, and so on. Been there, done that. So what's new for me to do? When personal computers were first developed, I got into that. In a very big way. Done that. When compact discs came along a little later, I did that. Big way again. Done that.

Flying? Done that. Sports car rallies? Done that. World travel? Done that.

So what's exciting for me now? My work with the New Hampshire Economic Development Commission a few years ago got me focused on investigating our school system, our government, the drug war, the war on poverty, the welfare mess, our health care system, and so on. Gradually the pieces began to fit together and I began to understand how all of us have been sold one hell of a crock of ... er ... baloney when it comes to our schools, our medical establishment, our jobs, our money, and our whole system of government and business.

Once I discovered how unbelievably dishonest everything really is, I wanted to help as many people as I could to stop being sucked in and free them to be able to make all the money they want, to regain their health and keep it, and then to help fix our major social problems. I guess I should apologize for being a Johnny One-Note on this subject, but that's the way I was when I got involved with building ham equipment, RTTY, then with repeaters, and again with personal computers, and then, still again, with compact discs. Now, I'm at it again, fighting your endless excuses and world class prize-winning procrastination. I've found a path through the jungle and I'm waving for you to follow. Well, I'm hoping you will.

We have what could be a really neat country. We have, mostly through our own carelessness, allowed politicians to take our money and use it to limit our freedoms. We've

allowed our states to confiscate our homes and property with what they call property taxes. That's rent, and if you don't pay the rent you'll find out that you don't actually own your home. We've allowed them to screw up our schools, the medical system, the courts, prisons, and so on. It's one hell of a mess and all unnecessary. And they've done it all with the money they've taken from you and me.

Foxhunting

The Garden City ARC newsletter mentioned that they are running foxhunts once a month. I wonder how many clubs are doing this? I sure don't see much of a sign of it in the club newsletters I'm getting. Yes, I read the newsletters.

How about some letters or articles for *73* on foxhunting? Maybe you've had some interesting adventures? Found some unusual places to hide the fox? Are your members doing all their hunting from cars or are you making them get out and walk? I think the US is the only country where much of the foxhunting is done in cars. Hams in most countries are out there on foot. It's good exercise for some of you pork-bellied hams.

What equipment are the winners using?

Have you considered doing some videos of your hunts? I'd love to see some. I'll never forget a Philmont film which showed them hiding the fox in the women's toilet of a police station, with the coax going out the window, under a lake, to the antenna mounted under a little bridge. The hunting cars drove over the bridge, with their antennas twirling to keep on target.

Ham clubs are desperate for entertainment, so if you can whup together some fun foxhunting material and make copies available, I think you'll get a lot of good PR for the club. You might even find other local clubs interested in seeing it too, like Lions. Elks, Chambers of Commerce. Rotary, etc. Heaven knows, amateur radio can use the publicity.

Lost Memories

My aunt is in her late 90s, and since my uncle died last year she hasn't been functioning well. I tried for several years to get her to sit down and start writing about how things were in our home town when she was young. It was a different world then, and to many of us, a fascinating one. So it's too late to get her to write now ... a lost treasure.

It wasn't until I started publishing my first magazine that I did much writing. Now I write every day and I enjoy it. Heck, I love it! There's so much to write about that I'll never run out. And no snide comments about my repeating myself. Sure, I do that, but mainly because when I wrote it the first (or 10th) time, I could see that it didn't stick. Secondarily, because I write for several publications, sometimes I forget what I've written *what* for.

Okay, that's enough about me. The person you are most interested in is you. Now, how can I get you to start writing? It gets easier and more fun the more you do it. What can you write about? Hell's bells, there must be something by now that you know more about than most other people. Or some adventure you've had that others would be interested in reading about.

Or, how about writing about the more exciting times you've had in amateur radio. It might be something I'd find interesting enough to publish. And I guarantee that your club newsletter editor will be tickled to get some help. I get dozens of club newsletters every month. Yes, I read 'em. And most, sad to say, are deadly snores. I keep hoping to read some stories about interesting foxhunts, about adventures members have had, DXpeditions, and so on.

Oh, you haven't been on a DXpedition? Lordy, what does it take to blast you out of that rut? I went on my first DXpedition 40 years ago and I still remember every minute of it. Wow, that was an exciting trip! We almost got killed ... twice! We went to Navassa Island, down between Haiti and Jamaica. It's a little desert island (about three square miles) with high cliffs all around, so even getting onto the island was a challenge. I was the licensee and got the call KC4AF. Some chap in Alabama has the call, now that they've changed the callsign system.

Then there was the all-ham African hunting safari in northern Kenya. That was another trip that none of us who were there will ever forget one minute of. Robby 5Z4ERR talked me into organizing it during our contacts on 20m.

Nowadays I write mostly about things I've researched. Have you bothered to get off your duff and make it your business to learn about something? What does it take to motivate you? It just isn't all that difficult to learn more about something than 99.9% of the public knows.

If you can't write from your experience or something you've learned about, how about trying poetry? We've about zero ham poets. I love poetry, so let's see what you can do. And please make it scan, okay? Golly, they taught us how to make poetry scan in the 3rd grade. Do they still teach that? And they taught us to read music about the same time, and how to tell good paintings from bad. I'll bet they don't teach that anymore. That education did well for me when I got interested in photography, and then really paid off when I became a TV cameraman. Soon I was made the chief cameraman at WPIX in New York and was doing one-hour variety shows all with my one camera.

Instead of using your computer to play games or wasting time rattling around the Internet, get into your word processor and let's see what emerges. Write for yourself. Write for me. Write for your club newsletter. Write to friends. If you're in business, then how about a newsletter for your customers to build their awareness of your products or services?

Just writing about this was fun for me. It brought back memories of the hunting safari, the time we almost got killed by the Somalian bandits ... and the ham European trip I organized on which we had an audience with the Pope. And making 10 GHz contacts from the top of Mt. Monadnock ... once in a dense fog while contacting New York, and several times freezing my fingers in the middle of the night while tuning for WA1KPS in Vermont or Connecticut. Or working all continents one morning in a half-hour when the skip was perfect. Working slow-scan TV from Jordan and from Navassa (on my second trip there as KC4DX). DXing from Swaziland, Nepal and other weird places. Well, these might not be worth reading about in 73, but such memories would be great for your club newsletter ... so how about writing about your ham adventures?

The Threat

I called David Jacobs to ask some questions about his book, *The Threat*, with the subtitle, "The Secret Agenda: What the Aliens Really Want ... and How They Plan to Get It," ISBN 0-684-81484-6, Simon & Schuster, 288 pages, 1998. He was too busy to answer many questions, and I had a bunch. He's a history professor at Temple University and had a stack of papers to grade before taking off for somewhere the next morning to give a talk. So I made a list of my questions and snailed 'em. Yeah, when I enjoy a book I often call or write the author — and that frequently leads to some fascinating conversations and new friends.

Dr. Jacobs has been teaching a regularly scheduled course on UFOs for 20 years and has hypnotically debriefed hundreds of abductees in an effort to find out what the aliens' program is all about. Yes, there are thousands of abductees, but very few of them remember anything about their abductions unless put under deep hypnosis. He found

Continued on page 64

Number 62 on your Feedback card

PROPAGATION

Jim Gray W1XU/7
210 E Chateau Circle
Payson AZ 85541
[jimpeg@netzone.com]

March 1999						
SUN	MON	TUE	WED	THU	FRI	SAT
	1 P	2 P	3 P-F	4 F	5 F	6 F-G
7 G	8 G-F	9 F	10 F	11 F	12 F-G	13 G
14 G	15 G	16 G-F	17 F-P	18 P	19 P-F	20 F
21 F	22 F	23 F	24 F-P	25 P	26 P	27 P-F
28 F	29 F	30 F-P	31 P			

Normally, a disturbed ionosphere would seem to be all bad, but such is not always the case. When disappearing filaments, coronal holes, flares, and the like appear on the solar disc facing the Earth, we can expect propagation disturbances—sometimes so severe that the HF bands virtually "shut down" because signals are absorbed by the over-stimulated ionosphere. *However*, once the effects begin to subside in a day or two, the ionosphere could be *excellent* for radio propagation on all HF bands. So, when you see a P (poor) or VP (very poor) on the calendar, be sure to check radio propagation on the higher HF bands a day or two *after*, even if the chart shows P–F (poor to fair) or (F) fair, because that is when the ionosphere recovers and is likely to be at its best.

This month's chart shows that the best days are likely to be March 6th, 7th, and 13th–15th, while the worst days are likely to be the 1st, 3rd, 18th, 25th, 26th, and 31st.

Band-by-band forecast

10–12 meters

Expect morning F2 path openings to Europe and Africa; on (G) days, midday path openings to South and Central America, and F2 path openings to Japan, Australasia and the Pacific during the afternoon at your location. DX moves west as the day progresses.

15–17 meters

Expect good DX paths to most areas of the world, with excellent openings from the northern hemisphere to Africa, South America, and the Pacific during hours of daylight and peaking during local afternoon. Good short-skip communication over 1000 miles will occur on (G) days.

20 meters

Very good DX openings to all areas of the world from sunrise through the early darkness hours. The signals will peak an hour or two after sunrise at your location, and again during the afternoon. Short skip beyond about 700 miles will occur during daytime hours.

30–40 meters

Good worldwide DX openings from sunset to sunrise should occur on (G) days. Noise levels (static) will be higher as Spring thunderstorms occur, and can depress audibility. Short skip between 100 and 1000 miles will occur during daylight hours, and at distances beyond 1000 miles at night.

80–160 meters

On 80, DX to the southern hemisphere and to Europe should occur after dark and during sunrise hours—limited, of course, by static noise levels. Daytime short skip to about 350 miles, and beyond 500 miles after dark, will prevail on (G) days. On 160, no daytime propagation will occur due to ionospheric absorption of signals, but after dark, peaking around midnight and again during the predawn hours, you should be able to work many areas of the world. Short skip from 1000–2000 miles or so will prevail during the nighttime hours ... but, as always, it will be limited by high static levels from thunderstorm activity.

Don't forget to work the *darkness path* (±30 minutes around local sunset).

Check the bands above and below the suggested ones for possible DX surprises. It's often a good idea to park your receiver on a seemingly unused frequency and just wait. A DX station is very likely to pop up before any one else hears him, and you can snag a good catch. Good hunting! W1XU/7.

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	15/17											15/17
ARGENTINA	20	20	30/40							10/12	10/12	15/17
AUSTRALIA	15/17				30/40	30/40	20	20			20	15/17
CANAL ZONE	20	30/40	30/40				20	20		10/12	10/12	20
ENGLAND	20		30/40	30/40				10/12	15/17	15/17	20	20
HAWAII	15/17			80	30/40	30/40	30/40				10/12	15/17
INDIA												
JAPAN	20						20	20	15/17	15/17	15/17	20
MEXICO	20/30	30/40	30/40				20	20		15/17	15/17	30/40
PHILIPPINES							17/20	17/20				
PUERTO RICO	30/40	40/20	40/80	40/80	40/80	40/20		17/20	10/12	10/12	15/17	15/17
RUSSIA (C.I.S.)	30/40						20/30	17/20	17/40			
SOUTH AFRICA			20/30					10/12	10/12	17/20	17/20	30/40
WEST COAST												

CENTRAL UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14/20	17/20	17/20		30/40	30/40				17/20	15/17	15/17
ARGENTINA	17/20	30/40									10/12	15/17
AUSTRALIA					30/40	10/12	17/20	17/20				15/17
CANAL ZONE	20	30		30/40	30/40			17/20	10/12	10/12	15/17	17/20
ENGLAND			40/80		30/40	30/40			15/17	17/20	20	
HAWAII	15/17	20/30			40/80	40/80	40/80	20/30			10/12	12/15
INDIA								20/30	17/20			
JAPAN	15/17	17/20				20/40	40/80	17/20				15/17
MEXICO	20	30		30/40	30/40			17/20	10/12	17/20	20	
PHILIPPINES	17/20	30/40					17/20	20/30				15/17
PUERTO RICO	20	30		30/40	30/40			17/20	10/12	15/17	20	
RUSSIA (C.I.S.)			30/40						15/17	17/20	20	
SOUTH AFRICA	17/20								10/12	17/20		17/20

WESTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	15/17	15/17	17/20			30/40	30/40					
ARGENTINA	10/12	15/17	20	30				30			15/17	10/12
AUSTRALIA	15/17	17/20					20/40					10/12
CANAL ZONE	17/20	20/30	20/30	30/40	30/40	80			15/17	10/12	10/12	17/20
ENGLAND				30/40	40/60				15/17	15/17	17/20	20
HAWAII	15/17	20/30						20/30	20/30		10/12	10/12
INDIA	17/20	20							17/20			
JAPAN	15/17	15/17	17/20			30/40	30/40					
MEXICO	17/20	20/30	20/30	30/40	30/40	30			15/17	10/12	10/12	17/20
PHILIPPINES	15/17	17/20	20	20		30/40			17/20	17/20		
PUERTO RICO	17/20	20/30	20/30	30/40	30/40	80			15/17	10/12	10/12	17/20
RUSSIA (C.I.S.)				30/40				20	15/17	20	17/20	
SOUTH AFRICA	20								17/20	15/17	17/20	20
EAST COAST												

Radio Bookshop

Here are some of the books Wayne has written. Some can change yonr life, if you'll let them. If the idea of being healthy, wealthy and wise is of interest to you, start reading. Yes, you can be all that, but only when you know the secrets which Wayne has spent a lifetime uncovering.

The Secret Guide to Health: Yes, there really is a secret to regaining your health and adding 30 to 60 years of healthy living to your life. The answer is simple, but it means making some very difficult changes. Will you be skiing the slopes of Aspen with me when you're 90 or doddering around a nursing home? Or pushing up daisies? No. I'm not selling any health products. $5 (H)

The Secret Guide to Wealth: Just as with health, you'll find that you have been brainwashed by "the system" into a pattern of life that will keep you from ever making much money and having the freedom to travel and do what you want. I explain how anyone can get a dream job with no college, no résumé, and even without any experience. I explain how you can get someone to happily pay you to learn what you need to know to start your own business. $5 (M)

The Secret Guide to Wisdom: This is a review of around a hundred books that will help you change your life. No, I don't sell these books. They're on a wide range of subjects and will help to make you a very interesting person. Wait'll you see some of the gems you've missed reading. $5 (B)

Cold Fusion Overview: This is both a brief history of cold fusion, which I predict will be one of the largest industries in the world in the 21st century, plus a simple explanation of how and why it works. This new field is going to generate a whole new bunch of billionaires, just as the personal computer industry did. $5 (C)

The Bioelectrifier Handbook: This explains how to build or buy a little electrical gadget that can help clean the blood of any virus, microbe, parasite, fungus or yeast. The process was discovered by scientists at the Albert Einstein College of Medicine, patented, and then hushed up. It's curing AIDS, hepatitis C, and a bunch of other serious illnesses. The circuit can be built for under $20 from the instructions in the book. $10 (A)

Moondoggle: After reading René's book, *NASA Mooned America*, I read everything I could find on our Moon landings. I watched the videos, looked carefully at the photos, read the astronaughts' biographies, and talked with some of my readers who worked for NASA. This book cites 25 good reasons I believe the whole Apollo program had to have been faked. $5 (D)

Mankind's Extinction Predictions: If any one of the experts who have written books predicting a soon-to-come catastrophe which will virtually wipe us all out are right, we're in trouble. In this book I explain about the various disaster scenarios, from Nostradamus, who says the poles will soon shift, wiping out 97% of mankind, to Sai Baba, who has recently warned his followers to get out of Japan and Australia before March6th this year. The worst part of these predictions is the accuracy record of some of the experts. Will it be a pole shift, a new ice age, a massive solar flare, a comet or asteroid, or even Y2K? I'm getting ready, how about you? $5 (E)

Wayne's Submarine Adventures in WWII: Yes, I spent from 1943-1945 on a submarine, right in the middle of the war with Japan. We almost got sunk several times, and twice I was in the right place at the right time to save the boat. What's it really like to be depth charged? And what's the daily life aboard a submarine like? There are some very funny stories. If you're near Mobile, please visit the Drum. $5 (S)

Improving State Government: Here are 24 ways that almost any state government can cut expenses enormously, while providing far better services. I explain how any government bureau or department can be gotten to cut its expenses by at least 50% in three years and do it cooperatively and enthusiastically. I explain how, by applying a new technology, the state can make it possible to provide all needed services without having to levy *any* taxes at all! Read the book, run for your legislature, and let's get busy making this country work like its founders wanted it to. Don't leave this for "someone else" to do. $5 (L)

Travel Diaries: You can travel amazingly inexpensively – once you know the ropes.Enjoy Sherry and my budget visits to Europe, Russia, and a bunch of other interesting places. How about a first class flight to Munich, a rented Audi, driving to visit Vienna, Krakow in Poland (and the famous salt mines), Prague, back to Munich, and the first class flight home for two, all for under $1,000. Yes, when you know how you can travel inexpensively, and still stay in first class hotels. $5 (T)

Wayne's Caribbean Adventures: More budget travel stories – where I visit the hams and scuba dive most of the islands of the Caribbean. Like the special Liat fare which allowed us to visit 11 countries in 21 days, with me diving all but one of the islands, Guadeloupe, where the hams kept me so busy with parties I didn't have time to dive. $5 (U)

Silver Wire: With two 3" pieces of heavy pure silver wire + three 9V batteries you can make a thousand dollars worth of silver colloid. What do you do with it? It does what the antibiotics do, but germs can't adapt to it. Use it to get rid of germs on food, for skin fungus, warts, and even to drink. Read some books on the uses of silver colloid, it's like magic. $15 (Y)

Classical Music Guide: A list of 100 CDs which will provide you with an outstanding collection of the finest classical music ever written. This is what you need to help you reduce stress. Classical music also raises youngsters' IQs, helps plants grow faster, and will make you healthier. Just wait'll you hear some of Gotschalk's fabulous music! $5 (Z)

Reprints of My Editorials from *73*.

Grist I: 50 of my best non-ham oriented editorials from before 1997. $5 (F)

Grist II: 50 more choice non-ham editorials from before 1997. $5 (G)

1997 Editorials: 240 pages. 216 editorials discussing health, ideas for new businesses, exciting new books I've discovered, ways to cure our country's more serious problems, flight 800, the Oklahoma City bombing, more Moon madness, and so on. In three $5 volumes. $15 (O)

1999 Jan-Aug Editorials: 188 pages in two $5 volumes. Bringing you up to date. $10 (P)

Ham-to-Ham: 45 of my ham-oriented editorials. These will help you bone up on ham history. Great stuff for ham club newsletter filler. Yes, of course these are controversial. $5 (Q)

$1 Million Sales Video: How to generate extra million in sales using PR. This will be one of the best investments your business ever made. $43 (V)

One Hour CW: Using this sneaky method even *you* can learn the Morse Code in one hour and pass that dumb 5wpm Tech-Plus ham test. $5. (CW)

Code Tape (T5): This tape will teach you the letters, numbers and punctuation you need to know if you are going on to learn the code at 13 wpm or 20 wpm. $5 (T5)

Code Tape (T13): Once you know the code for the letters (T5) you can go immediately to copying 13 wpm code (using my system). This should only take two or three days. $5 (T13)

Code Tape (T20): Start right out at 20 wpm and master it in a weekend for your Extra Class license. $5 (T20)

Code Tape (T25): Same deal. It doesn't take any longer to handle 25 wpm as it does 13. Or use the ARRL system & take six months.$5 (T25)

Wayne Talks at Dayton: This is a 90-minute tape of the talk I'd have given at the Dayton, if invited. $5 (W1)

Wayne Talks at Tampa: This is the talk I gave at the Tampa Global Sciences conference. I cover cold fusion, amateur radio, health, books you should read, and so on. $5 (W2)

Stuff I didn't write, but you need:

NASA Mooned America: René makes an air-tight case that NASA faked the Moon landings. This book will convince even you. $25 (R1)

Last Skeptic of Science: This is René's book where he debunks a bunch of accepted scientific beliefs – such as the ice ages, the Earth being a magnet, the Moon causing the tides, and etc. $25 (R2)

Elemental Energy Subscription: I predict this is going to be the largest industry in the world in about 20-30 years. They laughed at me when I predicted the personal computer growth in 1975. PCs are now the third largest industry in the world. The elemental energy ground floor is still wide open, but then that might mean giving up watching ball games and talk shows on the boob tube. $30 for six issues. (EE). A sample issue is $10.

Three Gatto Talks: A prize-winning teacher explains what's wrong with American schools and why our kids are not being educated. Why are Swedish youngsters, who start school at 7 years of age, leaving our kids in the dust? Our kids are intentionally being dumbed down by our school system — the least effective and most expensive in the world. $5 (K)

......Wayne

Radio Bookshop

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Items ordered - use letters or copy page and mark books wanted. Order total plus $3 s/h in US.$6Can.

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Yes! Put me down for a year of *73* for only $25 (a steal). Canada US$32. Foreign US$44 by sea, US$67 by air. Whew!

Number 64 on your Feedback card

Barter 'n' Buy

Turn your old ham and computer gear into cash now. Sure, you can wait for a hamfest to try and dump it, but you know you'll get a far more realistic price if you have it out where 100,000 active ham potential buyers can see it, rather than the few hundred local hams who come by a flea market table. Check your attic, garage, cellar and closet shelves and get cash for your ham and computer gear before it's too old to sell. You know you're not going to use it again, so why leave it for your widow to throw out? That stuff isn't getting any younger!

The *73* Flea Market, Barter 'n' Buy, costs you peanuts (almost)—comes to 35 cents a word for individual (noncommercial!) ads and $1.00 a word for commercial ads. Don't plan on telling a long story. Use abbreviations, cram it in. But be honest. There are plenty of hams who love to fix things, so if it doesn't work, say so.

Make your list, count the words, including your call, address and phone number. Include a check or your credit card number and expiration. If you're placing a commercial ad, include an additional phone number, separate from your ad.

This is a monthly magazine, not a daily newspaper, so figure a couple months before the action starts; then be prepared. If you get too many calls, you priced it low. If you don't get many calls, too high.

So get busy. Blow the dust off, check everything out, make sure it still works right and maybe you can help make a ham newcomer or retired old timer happy with that rig you're not using now. Or you might get busy on your computer and put together a list of small gear/parts to send to those interested?

Send your ads and payment to: *73 Magazine*, Barter 'n' Buy, 70 Hancock Rd., Peterborough NH 03458 and get set for the phone calls. The deadline for the June 1999 classified ad section is April 10, 1999.

NEVER SAY DIE

continued from page 61

that most of them started being abducted when children.

So what did Dr. Jacobs find out? You don't want to know.

Well, I'll give you a hint. The abductions have entirely to do with creating a breed of alien-human hybrids with which they plan to repopulate our world. They've been going to lengths to keep this program secret — which obviously they have to do in order not to have the rest of us in a panic.

How can we combat aliens who can both read our minds and control us so thoroughly that we don't even know anything has happened? That's enough to scare anyone.

Anyway, Jacobs has pieced together hints that the aliens have given here and there to abductees, but the memories of which hadn't been wiped out beyond the ability of deep hypnosis to retrieve.

So when are the aliens going to replace most of us with hybrids? The target seems to be 1999! Of course there's always the chance that some of the other aliens may not let the greys get away with this scheme. One thing is for sure — we'll soon see. How reliable is Jacobs' information? A Roper survey showed that about 2% of Americans have been abducted, so a breeding program with five million donors for breeding hybrids could, after a few years, provide them with one heck of an army. Jacobs gave the most credibility to the stories of abductees who were with other abductees (whom they didn't know) during their experiences and both reported the same events.

As a known troublemaker and iconoclast, I'll probably be one of the first to be eliminated. This could make the 175 million people that we and our governments have killed so far in this century amount to nothing!

We would appreciate it if you would

TELL A FRIEND

about the NEW 73 and show him this copy!

MAY FOOL 1999
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HAMVERTS — page 33

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MAY FOOL 1999
ISSUE #463

73® Amateur Radio Today

TABLE OF CONTENTS

FEATURES

REVIEW

DEPARTMENTS

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On the cover: WZ8A compared his vertical to a quad, page 33. Photo courtesy of WZ8A. We are always looking for interesting articles and cover photos — with or without each other. Your name could be in this space *next* month, and our check could be on its way to *you!* You couldn't use a little extra cash?

Feedback: Any circuit works better with feedback, so please take the time to report on how much you like, hate, or don't care one way or the other about the articles and columns in this issue. G = great!, O = okay, and U = ugh. The G's and O's will be continued. Enough U's and it's Silent Keysville. Hey, this is *your* communications medium, so don't just sit there scratching your...er...head. FYI: Feedback "number" is usually the page number on which the article or column starts.

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NEVER SAY DIE

Wayne Green W2NSD/1
w2nsd@aol.com

The May Fool Issue

"Where the hell is my damned April issue?" you're probably asking. Well, I cleaned that up a bit, since this is supposedly a family magazine, but that's probably the gist of your response to getting a May and no April issue of *73*.

Gee, mumble, mumble, you see, ahem, it was like this. We were stuck for something really unusual to do for the April issue that would get your attention and give you something to talk about on the air for a change. So Frances, our Associate Publisher, said that since our subscription fulfillment agency is so screwed up with the Y2K mess that they made us miss our press date for the April issue, let's put out the first totally invisible issue of the magazine for April and extend everyone's subscription by a month.

"But," I protested, "that'll mean that our subscribers will miss seeing our first frontal nude YL cover!"

"Tough tiddledywinks," Frances answered.

And, since Frances does most of the work around here, I tend not to argue with her. So I don't want to hear any bitching about the missing April issue. Permission is granted to talk about this May Fool issue as much as you want. And I'm sorry you missed getting the first frontal nude YL ham magazine cover in history. However, knowing how ridiculously straight-laced you are, it probably would have offended you and you'd have cancelled your subscription in anger.

Say, that's not a bad idea! I don't do refunds when subscribers cancel in anger, so we'd just have to print and mail fewer magazines. It could save us a bundle. Let's see, I've already offended all of the ARRL lackeys, gays, liberals and child molesters. Any suggestions on which group I should target next?

You Can Trust Your Doctor

Sure, with your life. You get sick, you go to the doctor, and you believe what he says. Well, that's what our parents teach us. That's what they were taught.

My grandmother worked it differently. She got sick and her doctor told her to stop drinking coffee. So she had to go to two more doctors before she found one that didn't say anything about her coffee drinking.

So I keep researching the medical industry and finding some gems. I'll bet you didn't know that 15,000 new drugs are marketed each year, and that 12,000 eventually have to be withdrawn. You know they're not going to withdraw a drug that isn't causing serious side effects. According to the FDA 1.5 million Americans were hospitalized in one year alone as a result of drugs that were prescribed to "cure" them. Worse, 30% of all hospitalized people suffered further damage from the therapy prescribed for them. Recently, the AMA *Journal* reported that there are 180,000 medically induced deaths each year in the US. And we're fussing about Dr. Kevorkian!

How safe are the drugs our doctors are prescribing? The statistics are not encouraging. Medicine is far from an exact science, and the odds are that your doctor is far from current in his knowledge of what's safe and what's not. Studies have shown that doctors get almost all of their data on drugs from the drug company salesmen — called detail men — and not from medical journals.

New drugs are tested on animals. Well, that's the cheapest way. The problem with this is that many drugs react differently in animals than people. It's bad enough that all people are different. We all look different, have different genes, different voices, different fingerprints, different allergies, and so on. So, just as the same drug often affects different animals differently, it can also affect different people quite differently. Vaccinations that immunize some people kill others, or can cause deafness, as with Miss America a couple years back. Deaf for life from a childhood vaccination.

There's much to be said for not making your body sick in the first place. But that's your choice.

Fighting City Hall

It doesn't pay, right? Well, they have that one right!

I got to thinking (hey, it happens!), that if you'd pay attention to what I've found with my research, and pass the word along, that we could upset some very large apple carts. But then I remember that Jesus was a contrarian who fought the establishment — you know, the money-changers — and here we are, 2000 years later, heading for 3000, and the money-changers are still in charge.

So which establishments am I fighting? Well, there's the $1.5 trillion "health care" industry, which would be devastated if enough people stopped getting sick via my *Secret Guide to Health*. How many trillions are involved with the food giants and the sugar industry? If you'd read what I've discovered, or check my resources, these industries would collapse. Read *Beating The Food Giants*, a $10 book by Paul Stitt, and *Lick The Sugar Habit*, a $6 book by Nancy Appleton, if you think I'm exaggerating.

With my *Cold Fusion Journal* I'm trying to help upset the oil, coal, and natural gas industries, their network of gas stations, plus the power companies and their power grid. See if you can figure out how big those industries are.

Then there's the public school industry and the teacher unions that control it, you, and your children.

When you consider that most of the media is bought and paid for by the giants I'd like to upset, you can see why my message isn't popular with radio, TV, magazines, newspapers, and so on. They all owe their existence to the trillions of advertising dollars poured into them by the establishments I'm fighting.

There is *no* industry supporting the growth and sale of healthy food to turn to for help. Eating raw food is a powerful first step, but even that is being grown by food giants on mineral-depleted land, complete with pesticides. Where can you be sure of getting meat that isn't packed with hormones and antibiotics?

Worker

Like the ants and the bees, we're raised and taught to be workers. The pressure comes from every side to convince us that we must be workers. Is that what you want to be all your life, a worker? Blue collar or white collar, is that what you want for your kids — to

Continued on page 58

QRX . . .

Ishmod Found?

Long-time readers of *73* may recall the saga of Ishmod Kaduk S7Z2B, a hard-luck Sikkimese ham whose DXpeditioning story was first reported in these pages during 1984 and 1985. Along with four companions, Kaduk apparently disappeared while investigating some strange propagation phenomena in the Bay of Bengal southeast of an area known as Chilka Lake (about 200 air miles south of Calcutta). According to Indian and U.S. authorities at the time (one of the companions was an American, Shelby Hator-Baroda), hope for the quintet was not great, given the savagery of local pirate gangs in that area of the world.

Now it seems that Ishmod, at least, may have made it and indeed even been found—thanks to the recent unrest in Indonesia. Two separate readers have sent us independent reports of a newspaper photo of someone bearing a quite older but still remarkable likeness to the photo of Ishmod we published on page 24 of our April 1985 issue. We have copies of this photo being sent to us as this issue goes to press, and Ishmod's rather affluent family is en route from Sikkim to continue the investigation at the scene of the reports, the Banjak Islands. They hope to arrive about April 1, ironically the western calendar equivalent of Ishmod's birthday. More on this in upcoming issues (please don't call for updates!) ...

Name Change?

The American Radio Relay League (ARRL) is considering the possibility of changing its name to something more appropriate for the technological progress of the 21st century.

The subject came up at a recent ARRL Board meeting, when directors requested the Executive Committee to submit some new name possibilities for consideration at their July, 1999, get-together.

At a time when hams are concerned about future FCC licensing privileges, competition with the Internet, and overcoming the stagnation in ARRL membership, Board members believe now is a good time to reconsider the organization's name and its appeal for attracting more members into the hobby.

It was ARRL founder Hiram Percy Maxim who in 1914 suggested that the organization's name should be the American Amateur Radio League. But he was voted down in favor of the current name.

However, in recent years there have been a growing number of radio amateurs who have criticized the "radio relay" terminology in the name. They maintain that the era of relaying radio messages is ancient history, and furthermore turns off potential members.

This is the second time in this decade that ARRL's Board has studied the possibility of a name change. In November, 1992, a *QST* magazine article sought opinions from members on the subject, but the Board tabled action on the possibility in January, 1993.

The League is encouraging suggestions ...

Tnx and a don't get us started to Ed Collins KC9RL, via the North Shore (MA) Radio Club *Transmitter*.

Sunrayce '99

Ham radio will play a key role in Sunrayce '99. Sunrayce is a biannual event that pits college-built solar-powered cars in a race across part of the United States. This year, Bill Eccles KE4VT has been appointed the event's ham radio communications coordinator.

Sunrayce '99 begins in Washington on June 20th. Overnight stops are scheduled for Charlottesville, Raleigh, Charlotte, Clemson and Atlanta at Georgia Tech. Then it's on to Macon, Tallahassee, and Ocala to finish up at the Disney Epcot Center in Orlando on June 29th. Eccles says that a lot of hams are needed to work on Sunrayce '99 communications. If you want to take part you can E-mail him at [William.Eccles@Rose-Hulman.edu].

Tnx and a don't forget to put your ears on to the *SERA Repeater Journal*, via *Newsline*, Bill Pasternak WA6ITF, editor.

ARRL E-mail

ARRL members can now announce their ARRL membership through their E-mail addresses. Starting February 1, 1999, a new membership service was available for those wishing to have an ARRL E-mail address, and you didn't have to switch E-mail services to do it. Not only that, but it is free-of-charge for League members.

The new, personalized League E-mail addresses will consist of the member's callsign@arrl.net. Electronic mail sent to the address automatically will be forwarded to any E-mail account you choose.

As long as you remain an ARRL member, you'll never have to notify people of an address change—even if you change Internet Service Providers.

Members are able to sign up quickly and easily through the ARRL Members Only Web site. If you are not already registered for the Members Only Web site, you can do so at [http://www.arrl.org/members/].

Members who are not registered for the Members Only Web site may also obtain their League addresses, but the procedure is a bit more time consuming. For instructions, send a blank message to [subscribe@arrl.net].

Tnx and a so that's what the dues increase was for to the ARRL, via the *marcKey*, newsletter of the Manteca (CA) ARC, Cathy Ledbetter KE6UTO, editor.

Heroic Texas Hams

After nearly two weeks of flood duty last fall, hams in Texas were battered but not beaten. Some individual stories of dedication and heroism also have begun to emerge from within the amateur radio ranks.

Many residents displaced by the flooding were forced to remain in Red Cross shelters for over a week. More than two dozen people died. South Texas Section Manager Ray Taylor N5NAV reported that at one point, hundreds of hams were active in Texas, Louisiana, Oklahoma, and Arkansas, handling various flood-related duties ranging from net control to shelter communication.

"We've had awful good cooperation," Taylor said. Some hams from as far away as Nacogdoches, near the Louisiana border, volunteered. Hams manning shelters got some relief when the Red Cross was able to get cell phones. "We are beginning to secure the Red Cross net here in San Antonio," Bexar County EC Neil Martin WA5FSR said after a few hectic days. There were still shelters open, but the Red Cross was prepared to handle everything by cell phone unless more problems developed.

Martin had said the net control station at the Red Cross was being staffed around the clock because they were "using a VHF/UHF linked system to communicate with shelters in Cuero, Victoria, and other areas toward the coast."

Martin singled out three San Antonio-area hams for special recognition—Shelter Communications Manager Bobby Rodriguez K5AUW, Red Cross Liaison Stan Stanukinos KA5IID, and Teri Thomas KC5BJI. "Bobby and Stan have been at the Red Cross communications center almost continuously since Saturday afternoon with only snatches of rest," he said. "Teri has done yeoman service in finding and scheduling operators."

Taylor said prompt response by a ham couple in his area, Comal County, made the difference between life and death for some residents of a flooded mobile home park there. Taylor said husband-and-wife team Susan and Leo Manor, NFØT and NØERI, went down to the trailer park to check out the situation. "Nobody had warned these people," Taylor said of the residents. Using their vehicle, the Manors were able to pull several trailers to higher ground before the water got too deep.

Continued on page 8

Number 8 on your Feedback card

LETTERS

From the Ham Shack

Burt Syverson K5CW, Plano TX. Very frequently in Letters to the Editor columns of amateur radio journals, we read letters complaining about the on-the-air antics of other amateurs whom most of us are ashamed of. However, these kinds of complaints are also seen in other publications outside of amateur radio, ones such as newspapers. These may be about kiddy-porn on the Internet or other such things, but they do have one common underlying theme. The writers of these letters are saying "I do not like this situation, I have done my part, I got it off of my chest by telling you about it and now I would like somebody else to do something about it, because I do not want to myself."

How nice it would be if it were just that simple, but it isn't. In these two situations, electronic communications is involved and supposedly the somebody who is supposed to pick up on these complaints and do something about it is the FCC. We amateurs have always been taught that the FCC was a strict disciplinarian with sweeping enforcement powers. As such, we regarded it with the utmost respect.

Gradually, over the last few decades, our image of it has faded somewhat. This has come about as we witnessed many situations in which the FCC did not react or do as we expected. This has resulted in it becoming known as a "paper tiger" in many circles.

On the surface, not knowing or understanding the position of the Commission, it would be very easy to condemn it for not doing its job. Before we do, though, let's consider a few things. Over the same period of time, the Commission's areas of responsibility have mushroomed into areas such as telephony, television, and satellites, to name a few. Being dependent on Congress for funding, its priorities are largely determined by responding to pressure from Congress.

The Hill in turn is influenced by large campaign contributors. In large numbers we could have influence, too. However, we choose not to. Therefore, you are more apt to see a cow jump over the Moon than a few letters to a gripe column goading anyone into action.

The Commission has another problem that by itself it can do little about. The First Amendment to our Constitution guarantees the right of free speech. Over 200 years ago, when it was written, the distance a human voice could be heard was measured in feet, so this was not a bad concept.

Realizing things might change in the future, our forefathers anticipated that the Constitution would need to be amended as conditions changed, so they made it amendable. This has not been done in light of present-day conditions. The result is that, in essence, we are trying to service a modern automobile with a shop repair manual for a Model T Ford. As it now stands, the courts' decisions must abide by the strict wording of the First Amendment, which says absolutely nothing about free speech with regard to communications electronically transmitted, so anything goes.

Nobody likes to lose, so it should be understandable that with little chance of winning, the Commission is not likely to waste its time and resources prosecuting violators pleading their First Amendment rights. Because anything less can be contested in the courts, a Constitutional amendment is the only way of correcting this. All that is needed is an amendment stating that the protection of the right of free speech does not extend to those accused of violating federal statutes governing electronically transmitted information.

You might ask, "Why doesn't somebody do this?" That is a very good question and it deserves a good answer or two. The first one is that no matter how badly a change is needed, a large sector of our population automatically refuses to listen to anything about it and opposes any changes to our Constitution. To them, anyone proposing such a change is talking blasphemy, being un-American, immoral, and against motherhood and apple pie as well. The second answer is that we, the public, either do not care enough or are not willing to take the time to let Congress know (whose job it is to do something) that we do care.

I have written my representative and senators several times in regard to this matter. Unfortunately, my lone voice apparently is not loud enough to impress them. Still, it does more good than to write to a gripe column—where it is not seen by them at all. It is also better than doing absolutely nothing at all. I tried. Have you?

QRX

continued from page 6

Taylor also credited Comal County EC Todd Covington N5IJR with taking time away from his own flood-damaged home to roll out the PrimeCo communications van and press it into flood duty service. Two repeaters in the van aided Red Cross communications.

Taylor said linked repeaters ensured wide coverage. In addition, hams in Texas made use of HF nets on 40 and 75 meters for regional coordination. In addition to helping the Red Cross, Taylor said, ham radio operators provided communication and other support for the Salvation Army, the Dallas-based Baptist Men's Kitchen feeding program, and other outside relief agencies.

Taylor himself was deeply involved in coordinating much of the flood emergency traffic throughout the affected region.

Tnx to the volunteer stars who shine big and bright and to *The ARRL Letter*, via *Chirps & Clicks and Spurious Emissions*, the joint publication of the Kalamazoo ARC and the Southwest Michigan AR Team.

Enforcer I

The FCC's new ham radio rules enforcer, Riley Hollingsworth K4ZDH, is taking a proactive role in curbing alleged rules violations. He is confronting—on the air—those whom the agency considers to be egregious offenders.

Hollingsworth showed up unexpectedly on 3.894 MHz on Wednesday, January 13th. This frequency is considered to be one of a number of hot spots that the rest of the ham community wants cooled down. Hollingsworth said he broke in on an argument that was growing increasingly nasty in an effort to calm things down. He then remained on frequency to discuss FCC enforcement with those hams who were interested.

However, not everyone wanted to hear what he had to say. According to reports on the Internet newsgroups, some operators made a serious effort to silence K4ZDH. He was jammed and some high-power stations made rude and lewd comments while Hollingsworth was on the air. Nonetheless, Hollingsworth told those involved in the 75-meter contact to keep in touch with him if they have enforcement problems, and offered a phone number and E-mail address where he

Continued on page 39

The Card-File 40

Here's a direct-conversion QRP transceiver you can build ...

David Cripe KC3ZQ
RR 2 Box 263
Camp Point IL 62320

While backpacking with the family this past summer, the thought occurred to me more than once that the few vacant cubic inches remaining within my pack could well be occupied by some ham gear. I have seen kits for QRP CW transceivers advertised in the ham magazines, and thought one of these would be ideal. So, being the independent type, I decided to design and build my own.

After determining the size constraints of the rig, I began by selecting the chassis box for it. While I sat at my workbench sketching out schematics for this project, my eye fell upon an unused three-by-five index card file box. It was made of light-gauge steel, which would provide RF shielding, and would be able to be machined easily. Perfect! For simplicity's sake, I decided the rig was to be a single-band design for 40 meters, with a direct-conversion receiver. From this humble start, a radio was born—the Card-File 40.

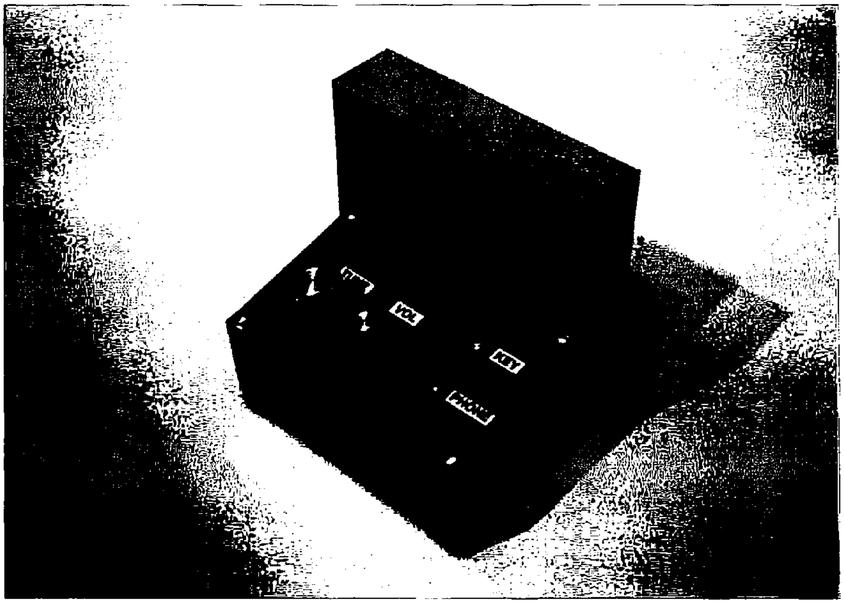

***Photo A.** The Card-File 40 in full splendor.*

Because of its simplicity, direct-conversion equipment has been a perennial favorite project for home brewers and QRP enthusiasts. I have seen dozens of designs for QRP transceivers published in the ham magazines over the years, and have built quite a few of them. Just for fun, in this project, I made a deliberate attempt not to borrow from any previously published design, so I started from scratch, breadboarding and testing each section as I went.

By the time I had built three different versions of the circuit, I finally arrived at one that did pretty much what I wanted it to do. The end result is unconventional in many parts of the design, but it derives more features from fewer parts than any other QRP rig I have seen. And it really works! The features of this transceiver include: coverage of the full 40 meter CW band, 2 watts output on transmit, VSWR-tolerant PA design, 25 mA current consumption on

receive, a high performance CW filter, a sidetone oscillator, and QSK.

But what is the price for this performance? I know first-hand what a pain home-brew projects can be. My biggest headaches? Winding coils and locating parts. Since I wanted this to be a pain-free project, I limited the circuit to three coils, and selected only generic components to use within this rig. Everything that goes into this rig can be found in standard electronics catalogs, and cost of the whole project was less than $35. Interested yet?

Take a look at the schematic, **Fig. 1**. All of the circuit functions have been labeled. Let's take an overview of the circuit to help understand how it works.

The heart of a direct-conversion transceiver is its VFO. In the transmit mode, the VFO signal is amplified and coupled to the antenna. In the receive mode, the VFO signal drives the mixer to demodulate the antenna signal. In the schematic of the transceiver, the VFO is in the upper left corner. Is that all there is, you may ask? Where are the JFET, the buffer transistors, the output-matching transformer, and the biasing components one expects to find in a VFO? All of these functions are performed in this circuit, a Hartley oscillator using one gate of U1, a 74HC86 quad-XOR gate, as the amplifier. The logic gate has low input capacitance, high gain, and high output drive capacity, so it works quite well in a VFO circuit, with far fewer parts than the usual designs.

While I initially considered using a variable capacitor to tune the VFO, it occurred to me that most hams are not going to have a small-value variable capacitor and a vernier reduction drive in their junk boxes. So, scratch that idea! What I ended up with was a VFO that is actually a VCO—voltage-controlled oscillator. While there are some transceiver kits that use voltage-controlled-capacitance diodes (varactors) to tune their VFOs, I opted for a simpler and more economical approach—using the voltage-variable drain-source capacitance of Q3, a 2N7000 MOSFET, to tune the oscillator. The voltage on the drain of this device is controlled by a ten-turn, panel-mount pot, a device available though Mouser and Digi-Key, among others. This circuit covers the entire CW portion of 40 meters, at roughly 15 kHz per revolution of the tuning pot—a tame enough ratio for a CW receiver. For improved stability, the VCO components are shielded in a

Continued on page 12

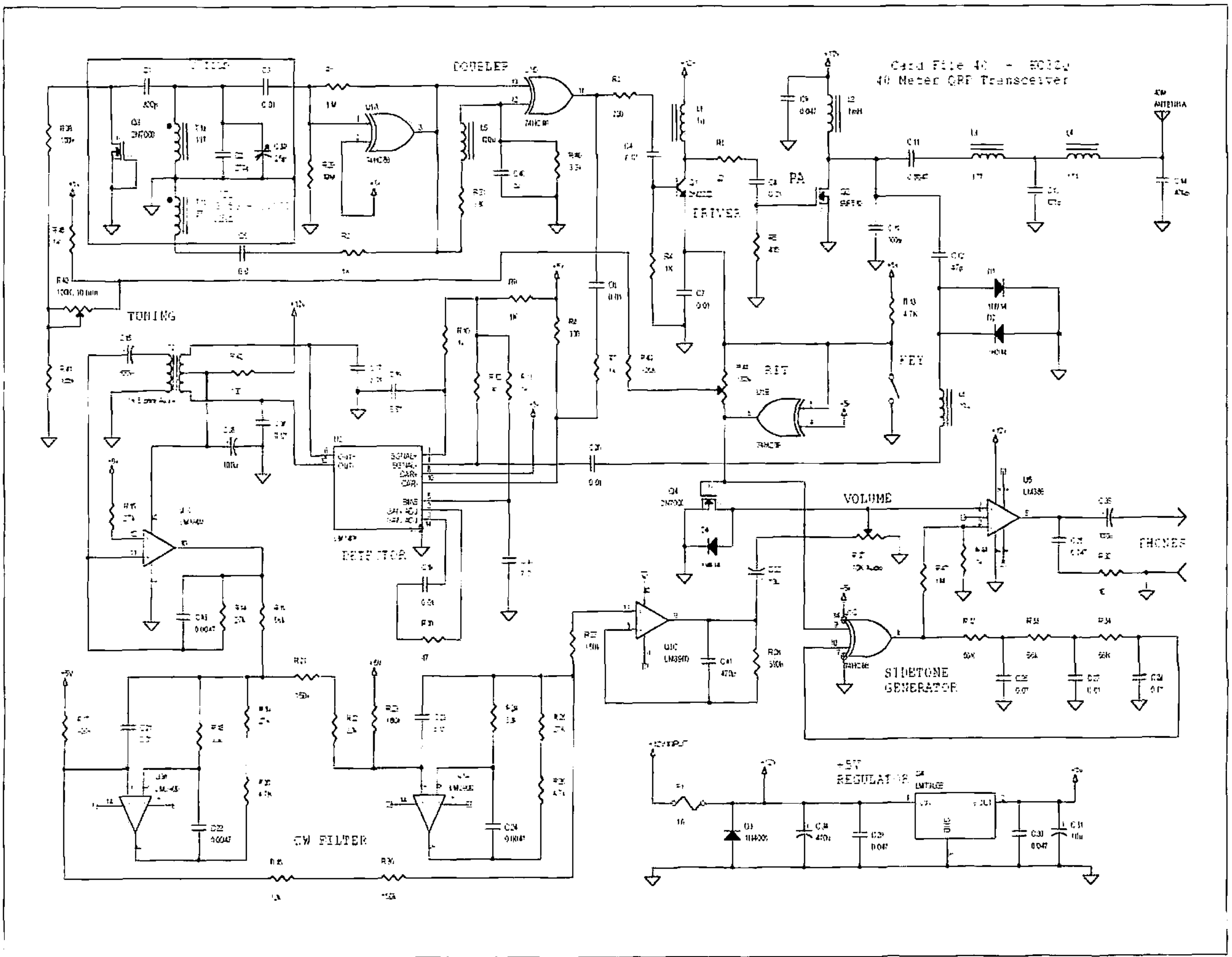

Fig. 1. Schematic for the Card-File 40.

PARTS LIST

R1, 47	1 M	**R28**	390 k
R2, 5	470	**R29**	10 M
R3	220	**R30**	10
R4, 7, 9–12, 45, 48	1 k	**R39**	47
R6	22	**R16, 32–34**	56 k
R8, 31	330	**R35**	12 k
R13, 20, 26	4.7 k	**R37**	10 k audio taper pot (vol.)
R14, 15, 19, 25	27 k	**R40**	100 k 10-turn panel-mount pot (tuning)
R17, 23, 38, 41, 43	100 k	**R42**	100
R18, 24	33 k	**R44**	100 k miniature trimpot (RIT)
R21, 27, 36	150 k	**R46**	3.3 k
R22	22 k	All resistors 1/4 W 5% or better, unless otherwise noted.	
C1, 13	820 pF 5% silver mica or NPO	**C15, 35, 38**	100 µF 16 V electrolytic
C2, 41	270 pF 5% NPO	**C21, 23**	0.01 µF 5% poly
C3–9, 17–20, 26–28, 33, 36, 37	0.01 µF ceramic	**C25, 29, 30**	0.047 µF ceramic
C10	100 pF 5% sliver mica or NPO	**C31, 32**	10 µF 16 V electrolytic
C11, 16, 22, 24	0.0047 µF 5% poly	**C34**	470 µF 16 V electrolytic
C12	47 pF ceramic	**C39**	25 pF trimmer
C14	470 pF 5% silver mica or NPO	**C40**	3 pF NPO
Q1	2N2222	**Q2**	IRF510 or IRF511
Q3, 4	2N7000		
D1, 2, 4	1N914 or 1N4148	**D3**	1N4001 or equivalent
U1	74HC86 quad XOR gate — DO NOT substitute 74HCT86		
U2	LM1496 double-balanced mixer	**U4**	78L05 5 volt regulator
U3	LM3900 quad Norton amp	**U5**	LM386 audio amp
T1	Primary: 33T 26 AWG. Sec.: 2T 22 AWG on T-50-2 core	**T2**	1 k CT 8 ohm audio transformer
L1	1 µH axial RF choke or 15T 22 AWG on T-50-2 core	**L4**	1.4 µH 17T 22 AWG on T-50-2 core
L2	1 mH 200 mA axial RF choke	**L5**	120 µH axial RF choke
L3	1.6 µH 18T 22 AWG on T-50-2 core	**L6**	10 µH axial RF choke
F1	1 A fast-blow in line with power cord		

The Card-File 40

continued from page 11

small enclosure made of copperclad PC board material.

Using a VCO in this manner makes addition of an RIT a simple matter. A sample of the keyer voltage is added into the VCO control voltage to shift its frequency during transmitter keying, so that a received, demodulated signal on the same frequency as the transmitter frequency will fall within the 700 Hz CW filter.

Notice that the output of the VCO is indicated in the schematic as 3.500 to 3.575 MHz, half that of the transceiver operating frequency. The VCO frequency cannot be the same as the transmitter frequency, or else during transmit, energy from the RF power amplifier circuitry will enter the VCO, causing its frequency to be pulled. So, we generate our VCO signal at half the transceiver frequency, and use a frequency-doubler circuit to keep the VCO well-behaved. This doubler circuit consists of XOR gate U1D and phase-shift network L5, C40, and R46.

The output of the VFO doubler U1D is coupled to the pre-driver amplifier Q1, a 2N2222 transistor, which in turn drives Q2, the power amplifier transistor, an IRF510 MOSFET. To reduce the final amplifier drive requirements, the inductor in the collector circuit of Q1 is resonated against the gate capacitance of Q2. The output of the PA is low-pass-filtered by a broadband pi-L network, and delivers 2 watts into 50 ohms, with the second harmonic down 40 dB. The efficiency of this power amplifier is superb, at least 80%, so no heat-sinking of the PA transistor is necessary. Another nice feature of this design is that the PA transistor does not self-destruct if the transmitter is keyed with no antenna attached. No one likes to have to do field repairs!

Turning now to the receiver side of the Card-File 40, I have seen a number of different devices used for the demodulator of direct-conversion receivers, including diode-ring mixers, dual-gate MOSFETs, NE602 or CA3028 ICs. I chose here to use an LM1496 mixer IC simply because it is the least expensive and most commonly available

device of the group. It has the advantage of possessing conversion gain, which acts as the equivalent of one stage of RF amplification. Additionally, the LM1496 has better dynamic range than an NE602, and better rejection of in-band AM signals than a dual-gate MOSFET. The VCO doubler drives the carrier input of the LM1496, and a sample of the antenna voltage drives its signal input.

One portion of this design that has been used in many other QRP transceivers is the transmit/receive switching circuit, which couples the antenna signal through C12 into the signal input of the LM1496. Shunt diodes D1 and D2 connect between C12 and ground. During transmit, the high amplitude of voltage applied to C12 will be clamped by these diodes prior to reaching U2, preventing this IC from being damaged by overvoltage at the signal input. When no large signals are present at the antenna during receive, these diodes possess a high impedance, allowing antenna energy to reach the LM1496.

The output of the LM1496 is coupled through audio transformer T2, and is amplified by one section of U3, an LM3900 op amp. Those familiar with this part will recognize it as a Norton op amp, which is a device providing current gain, as opposed to conventional op amps, which provide voltage gain. The Norton op amp possesses low-impedance inputs, referenced to ground. This, plus the very low power consumption of the part, make it well suited for operation from a single 12 volt battery supply.

Filtering of the CW signal is performed by sections A and B of the LM3900. This circuit is a 200 Hz wide, Blinchokoff bandpass filter centered at 700 Hz (see my *73* article "HI-PER Audio Filter," May 1994), possessing very low overshoot and ringing for best intelligibility of the CW signal. Use of this particular active circuit topology allows this filter to be constructed without requiring high-precision components. Those familiar with use of a direct-conversion receiver will appreciate the extra attention to the CW filtering. Admittedly, compared

to a single-sideband, superheterodyne rig, a direct-conversion receiver is at somewhat of a disadvantage due to its lack of single-signal reception, which increases the received QRM and QRN. Addition of a high performance filter such as this goes a long way to making this a usable transceiver. In this circuit, the virtues of the Norton op amp are especially apparent. If conventional op amps were used instead, two additional op amps and six extra resistors would be required to perform the same filtering function.

Section C of the LM3900 buffers and amplifies the output of the CW filter where the output of this amplifier stage is clipped by diode D4 and the body diode of Q4 to limit noise from transmit/receive transients, atmospherics, etc. The signal from U3C enters volume-control resistor R37 on its way to U5, an LM386 audio driver IC. This provides output for a pair of 8-ohm headphones. Transistor Q4, a 2N7000 MOSFET, also serves as a receiver mute. The gate of this MOSFET is tied to the keying voltage from U1B, which causes this transistor to shunt the receiver signal from the input of the U5 to ground when the key is down. For a sidetone monitor, section D of U1 is set up as a 700 Hz phase-shift oscillator, which is coupled into the audio amplifier though R47.

Overall, the receiver possesses on the order of 110 dB gain from antenna to headphones, and if proper board layout is followed, there is no tendency for oscillations or microphonics in the audio.

A nominal power supply of 12.6 volts is required to operate this transceiver. Diode D1 and a one-amp fuse protect the circuit against accidental reverse-voltage connections. A 78L05 regulator provides a stable five volts for the VCO circuit, preventing drift or chirp of the CW signal.

The radio-frequency coils used in this rig are fairly simple to build—they are all wound on Amidon T-50-2 iron-powder toroidal cores, with enameled copper wire used for the windings. Remember that turns are counted as the number of times the wire passes through the center of the core. Pay attention also to the winding direction of the secondary of the VCO coil. If it is the wrong direction, the VCO will not oscillate!

I built up the circuitry on a three-by-five-inch piece of copperclad PC-board material, cut to fit inside the card-file box. Components were mounted using the "dead-bug" construction method, using the PC board as a ground plane. Keeping the construction simple, the circuit board was mounted on the base of the box with standoffs. I soldered brass 6-32 nuts inside the upper corners of the box to mount the front panel. Holes in the back were drilled to accommodate the antenna coax connector and 12 volt power plug. The front panel was cut out of a piece of copperclad PC board material, with holes drilled for the tuning and volume controls, the headphone and key jacks, and the mounting screws. Mount the front panel copperside down for best grounding. Using a card-file box like this protects the knobs and jacks under the lid of the box when it is closed and not in use. Also, there is enough room under the lid to store a pair of ear-bud style headphones, a small straight-key, or maybe a pad of paper for logging while you are operating in the wilderness.

Final alignment of the transceiver requires a frequency counter or calibrated receiver. First, it is necessary to ascertain that the doubled-VCO frequency covers the desired frequency range, from one end to the other of the tuning control—7.000 to 7.150 MHz. Trimcap C39 is used to shift the frequency range. If the frequency range cannot be brought into range using C39, it is possible to add or subtract a turn from the toroid T1 to alter its inductance as needed.

The RIT control R44 must be adjusted so that the VCO frequency shifts by 700 Hz between transmit and receive modes. With a 50 ohm dummy load on the antenna connector, key the transmitter, and observe the frequency shift. If calibrating using a receiver without fine resolution on its readout, we can set the RIT by setting the calibration receiver tuning to zero-beat against the VCO frequency. On key-down of the transceiver, its VCO frequency should be heard in the calibration receiver as a

700 Hz audio tone—roughly F above middle C if you have access to a piano, or the same pitch as the sidetone oscillator in the transceiver. Set R44 as necessary and repeat until the RIT offset is where is needs to be.

For the Extra Class hams, the lack of dial calibration is not a problem—you just operate where you hear other CW operators working. But for those who are limited in the frequencies they can use, and need to keep track of their frequency, it is a good idea to add a turns-counter knob. These are available from Mouser and Digi-Key. You can then calibrate the VFO against another receiver, and put together a conversion chart to determine the actual frequency of the rig versus the position of the tuning control knob. This chart may be mounted on the inside lid of the chassis box.

After the final tweaking has been performed, paint the VCO coil with clear fingernail polish or Q-dope to hold the turns in place, and reduce its susceptibility to microphonics.

How does it operate? Not too bad! On the receiver side, this rig is hot enough to hear anything I can pick up with my "real" ham equipment. The CW filter really cuts the noise without distorting the signal, so the audio is comfortable to listen to. With a well-regulated power supply, the transmitted signal was found to be clean and chirpfree. My first contact using this rig was with a W4 in Florida; my second QSO was with a CL2 in Cuba! It sure is a pleasure to receive T-9s on a home-brew rig!

There is plenty of room left within the card-file box for other options to customize your Card-File 40. You could add ten NiCd AA cells to make the rig truly portable. You could add a simple keyer circuit, perhaps a crystal oscillator calibration circuit, or any of many other many possibilities. Or, if you are like me, you will have so much fun with this little rig that you won't want to take it off the air long enough to modify it. Enjoy this project—I sure did—and I'll look for you on 40 meters!

Sources

(T-50-2 cores)
Amidon Inc.
P.O. Box 25867
Santa Ana CA 92799
(714) 850-4660

Mouser Electronics
958 Main
Mansfield TX 76063
(800) 346-6873

Digi-Key
701 Brooks Ave. South
Thief River Falls MN 56701
(800) 344-4539 73

The EZ-BZ Deck Antenna

A compact 20-meter dipole with linear loading and a bend.

Al Bregman AB2BZ
10 Anthony Drive
New Paltz NY 12561

If you'd like a compact 20-meter antenna that can be erected on your deck or porch in a jiffy, consider building the EZ-BZ. For an investment of about $25 in materials (excluding coax) and a couple of hours at your workbench, you'll have a 20-meter dipole that's much smaller than a standard half-wavelength dipole, yet performs very well.

The EZ-BZ gets me good signal reports on SSB with my Ten-Tec Argosy at 50 watts and also with my 12-watt monobander. an MFJ Model 9420. Some DX stations are surprised to learn that I'm using modest power and a home-brew loaded dipole—from my deck!

Design and construction

About a year ago, I set out to design and build a compact 20-meter dipole that could be easily erected on my deck and quickly dismantled at day's end. Ideally, its performance on 20 meters wouldn't be too different from that of my half-size G5RV. The result of my efforts is the EZ-BZ deck antenna, named for its easy *(EZ)* assembly and its two main components, *B*amboo stakes and *Z*ip cord (not to mention my call!). Long a favorite for home-brew antenna projects, bamboo combines rigidity and light weight, and is readily available at garden supply stores. Two six-foot bamboo stakes support the wire radiator: ordinary 18-gauge zip cord. Zip cord was chosen because it is insulated and very flexible.

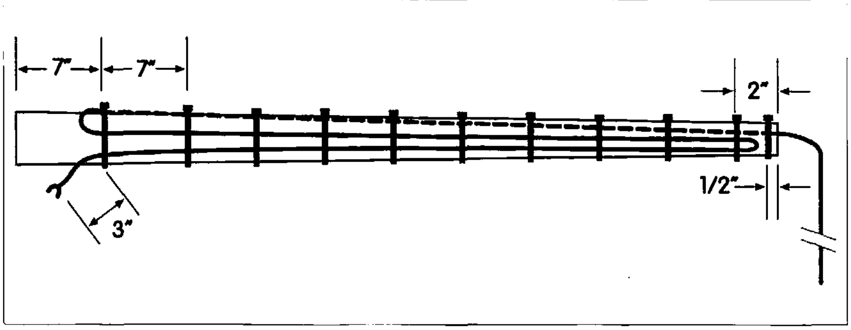

Fig. 1. Linear loading of the zip cord on a bamboo stake (not to scale). See text for details.

At the outset, I knew that some form of loading would be required. I opted for linear loading because it is considered to be less "lossy" than a loading coil. In the EZ-BZ, the linear loading consists of three lengthwise runs of zip cord along each six-foot bamboo stake (**Fig. 1**). To make the antenna resonant at 14 MHz, an additional six feet (approximately) of zip cord are required. The six feet of zip cord simply droop from the end of each stake, making the EZ-BZ a bent dipole. The bent dipole design keeps the horizontal span to a minimum (11 feet), yet does not cause very much signal loss.

The zip cord is fed directly by RG-58 coaxial cable, without a balun. The coax is connected to the zip cord via two screws in the conduit portion of the antenna mount (**Fig. 2**). The other prominent feature of the antenna mount is a PVC T. The T holds the two stakes securely, yet permits the antenna to be assembled or dismantled in just a few minutes.

Assembling the antenna mount

The parts required for the EZ-BZ are

listed in **Table 1.** The antenna mount consists of a heavy-duty 1-1/4-inch PVC T attached to a length of 1-1/4-inch PVC electrical conduit **(Fig. 2)**. I used a one-foot length of conduit, but for some installations a longer conduit might be more appropriate. The first step in constructing the antenna mount is drilling two 5/32-inch holes in the conduit to accommodate the screws. The screw holes should be one-half inch below the junction of the conduit and the T. A one-quarter-inch hole, drilled five inches below the screw holes, permits the coax to exit the conduit.

The PVC T supports the two bamboo stakes by their own levered weight against the inner edges of the T (**Fig. 2**). The angle between the two stakes is about 150°, making the EZ-BZ a—slightly—inverted V. As an option, you can increase that angle to about 165° by reducing the interior diameter of the PVC T. Simply insert a one-inch length of the PVC conduit into each end of the T until the ends of the inserts are flush with the ends of the T.

Selecting and weatherproofing the bamboo stakes

The pair of bamboo stakes used for the antenna should be fairly straight and have about the same diameter. Weatherproofing is done with a wrap of black vinyl electrical tape. The tape is wrapped from the tapered end of the stake toward the wide end, with an overlap of about half the tape width on successive turns.

Attaching the zip cord to the stakes

In the finished product, the zip cord is secured to the wrapped bamboo stakes with cable ties. Since the snugged-up cable ties cannot be loosened, the zip cord is initially affixed with twist ties. Begin the process by completely separating the two conductors in 23 feet of zip cord and attaching a split ring connector to one end of each. The split ring connectors will be at the feedpoint.

Fig. 1 shows the pattern of the linear loading on a bamboo stake. The pattern of the runs on the two stakes should be mirror images, since the two halves of a dipole should be mirror

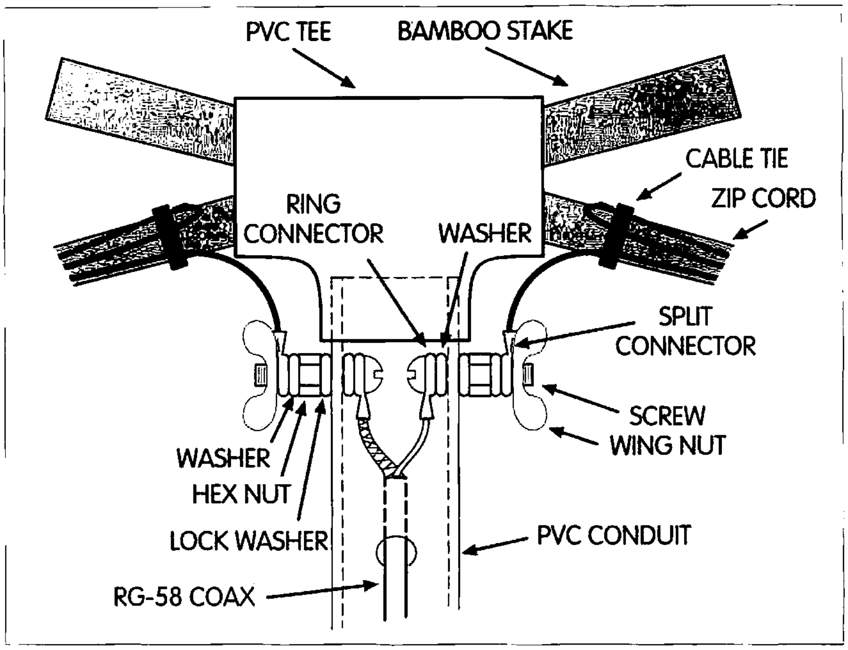

Fig. 2. Construction details of the antenna mount, showing the PVC T, which supports the bamboo stakes, and the connections of coax to zip cord via screws in the PVC conduit.

images of each other. Start the first lengthwise run by attaching the zip cord, three inches from the split ring connector, to a wrapped bamboo stake, seven inches from the wide end. Secure the zip cord with twist ties every seven inches (or closer), with the last tie being two inches from the tapered end. After the third (final) run, add a twist tie one-half inch from the tapered end so that the "tail" will droop from the tip.

Approximately six-and-a-half feet of zip cord will initially hang free from the end of each stake. The exact length doesn't matter at this stage, but it should be the same on the two stakes. If not, adjust the lengths of the runs so that the overhangs are the same.

Finally, replace the twist ties with cable ties. At the turns, secure the cable ties over both wires. Check that the adjacent runs of zip cord are evenly spaced around the circumference of the stake and that they do not touch each other.

Assembling and erecting the antenna

To assemble the antenna, insert the wide ends of the bamboo stakes into opposite ends of the T until about an inch of each stake protrudes from the other side. After you secure the split ring connectors with the wing nuts, the antenna can be erected.

The required mast height will depend on the height of the deck. For my deck, a 10-foot mast seems adequate because the deck floor is nine feet above the ground. I use two five-foot lengths of one-and-one-quarter-inch PVC electrical conduit, which is the same conduit used for the antenna mount. Electrical conduit is sold in 10-foot lengths, with one end flared. I strap one five-foot section to a deck post and insert the other five-foot section into the flared opening of the bottom section. A PVC connector secures the antenna mount to the top of the mast. To rotate the antenna, I simply turn the mast by hand.

CAUTION: The ends of a dipole have high RF voltages, which can cause burns. The antenna should be erected high enough or the deck cordoned off that the ends cannot come into contact with people or animals. For RF safety, the power output should be limited—and antennas should never be erected near power lines.

Adjusting antenna length

The electrical length of the EZ-BZ is adjusted after the antenna has been erected on a mast at its final location. For a deck installation, the EZ-BZ should initially be positioned so that the axis of the antenna is perpendicular to the side of the house. This orientation generally gives the lowest SWR readings.

When adjusting the length of the zip cord, trim both drooping ends about one-half inch at a time until the SWR is at a minimum at the desired frequency. Initially, my 20-meter EZ-BZ had an overhang of six feet, six inches, and was resonant at 13.7 MHz (1:1 SWR). Trimming eight inches from each drooping end (final length: five feet, 10 inches) increased the resonant frequency to 14.15 MHz (1:1 SWR). The SWR curve is shown in **Fig. 3**. Since the SWR does not exceed 1.7:1 across the entire 20-meter band, I am comfortable using the EZ-BZ without an antenna tuner. All SWR measurements were made with an Autek RF Analyst, Model RF-1.

Parts List

Qty.	Description
23 ft.	black 18-gauge zip cord
6	6-foot bamboo stakes
2	round head 8-32 3/4-inch brass screws
2	brass hex nuts
2	brass wing nuts
4	brass washers
2	bronze lockwashers
2	ring connectors
2	split ring connectors
	Black vinyl electrical tape, 3/4-inch or 1-inch wide
	4-3/8-inch-long (across top) heavy-duty PVC tee, 1-1/4-inch diameter
	Schedule 40 PVC electrical conduit (gray), 1-1/4-inch diameter
	RG-58 coaxial cable
	Cable ties
	Twist ties

Table 1. Parts list.

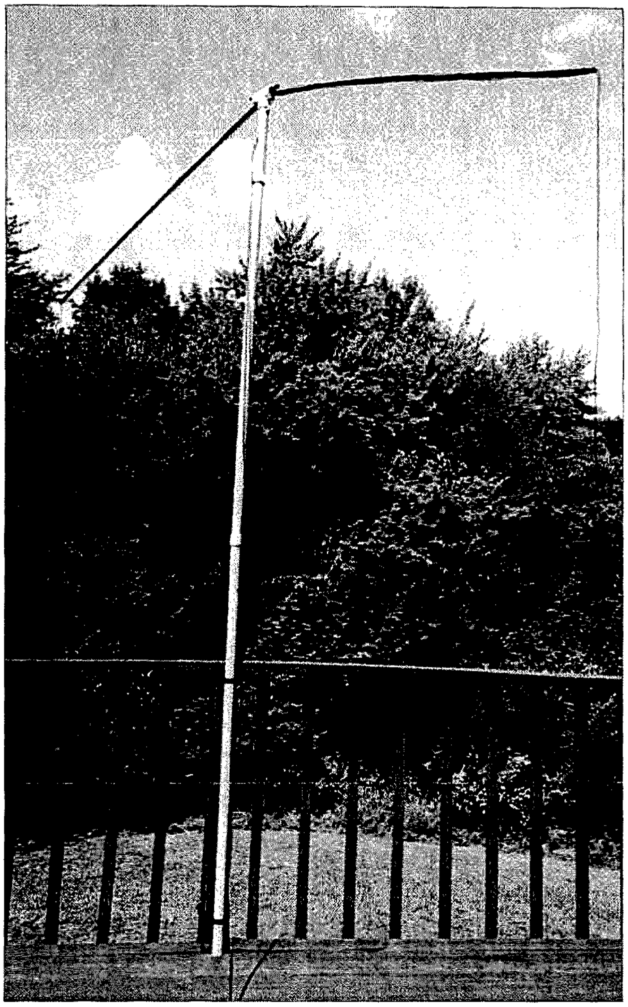

Photo A. The 20-meter EZ-BZ antenna erected on the author's deck.

The basic design of the EZ-BZ can be adapted for use on other HF bands. Trimming the tails to about 21 inches creates a 17-meter EZ-BZ. For a 10-meter EZ-BZ, no linear loading is required. Each bamboo stake supports about eight feet, one inch of zip cord: five feet, eight inches are attached to the six-foot stake and the remaining two feet, five inches droop from the tapered end. To work more than one band, just switch the bamboo stakes, which takes only few minutes.

Performance

I have used the 20-meter EZ-BZ for nearly a year with considerable success. Using the Argosy at 50 watts, I have compared its performance to that of my half-size G5RV. The EZ-BZ was erected 20 feet above the ground and rotated to the same orientation as the G5RV, which is 35 feet above the ground. The comparisons were made the old-fashioned way—by switching antennas during QSOs with very patient hams. In a QSO with Andy VE3ORE, located 200 miles north of Toronto, the signal report was S7 for both antennas. Likewise, Dick K9FA in Wisconsin could detect no difference in signal strength, with both antennas scoring S8. An interesting comparison was made during a QSO with two hams, John VE6AIV in Alberta (Canada) and Larry W4ERN in Florida. John gave the edge to the EZ-BZ (S6 vs. S5), while Larry gave it to the G5RV (S7 vs. S6). In all of the comparisons, I could detect no obvious differences in signal strength on receive. Rotating the EZ-BZ occasionally results in a change in signal strength, but rarely is the difference dramatic.

In conclusion, the EZ-BZ has definitely met my requirements for a compact, easy-to-assemble antenna with respectable performance. It may be just the ticket for those who would like to "clear the deck" and make way for a different style of hamming!

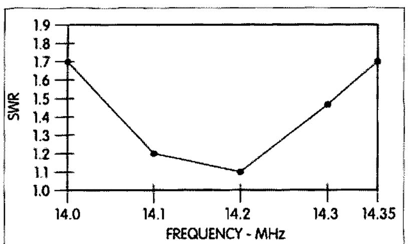

Fig. 3. The 20-meter SWR curve.

Number 20 on your Feedback card

Our Exciting New Fox

How one club settled on the Hamtronics T301.

Larry Antonuk WB9RRT
P.O. Box 452
Marlborough NH 03455

The storms of winter were just a memory, and the first signs of spring were showing through. In some areas, the thoughts of young men turned to love. In our neck of the woods, however, it was obviously time to start planning the early summer foxhunts!

Wanted: a new fox

Our last year of foxhunting had been fairly successful. Still, the club had found itself in a couple of embarrassing predicaments. Once, the small handheld we were using as the fox blew its RF power amplifier transistor. This happened midway through the hunt, so by the time anyone figured out what was wrong, it was too late to restart. Another time, we had some miscommunication concerning the actual hunt frequency. Normally this wouldn't have been a problem, but we had a few hunters with rock-bound receivers. At that time we were using an older rock-bound mobile rig, so neither the fox nor the hunters were able to QSY. These guys wound up hunting with other groups, but there was a fair amount of grumbling that could have been averted by a frequency-agile fox.

So what do we need?

We set a few minutes aside during our last club meeting to hash over the situation. As we discussed the requirements for the next club purchase, several points became clear. We needed only a few watts of output power for the type of hunts in which we were interested. We needed frequency programming ability, but it didn't need to be fancy.

(As a matter of fact, we remembered one hunt in which the frequency control had been bumped one notch as the fox was being hidden. This wasn't noticed right off, but by the time we got back to the starting point, the signal was noticeably raspy. This just added more challenge to that hunt, but someone remarked that it shouldn't be too easy to change channels!)

The reprogramming would only take place once or twice a month at most. We were also interested in a means of reprogramming that was easy to interface to. We had some special hunts where the fox hider would try some special tricks, such as switching between two freqs during the hunt, or varying the frequency plus or minus twenty kHz at various points in the hunt. This made the hunt more "lifelike." This was the downside of our hobby—we found ourselves practicing for jamming situations more often than enjoying plain old competitive hunts.

We also wanted true continuous-duty operation. In case the controller went crazy and stayed in PTT, we didn't want the transmitter to melt down. We also wanted a transmitter we could use during club demos and training sessions—not continuously, but to key-down for a couple of minutes at a time without getting nervous about it. Finally, we wanted something we could fix ourselves, and that had good factory support if we needed it.

Steep requirements

This seemed like a fairly steep set of requirements, but by the time someone mentioned continuous-duty operation, a few club members had already pulled catalogs from their pocket. The fact that they were all Hamtronics catalogs was neither a coincidence nor a conspiracy.

Our club had used several Hamtronics products in the past—their dedicated receivers and transmitters were currently in our repeater, RF links, and a couple of APRS applications. The group was familiar with the quality available as well as the customer support. The question was no longer "which vendor" but just "what transmitter." As it turned out, this decision was predetermined as well. Hamtronics had a unit that fit our requirements perfectly.

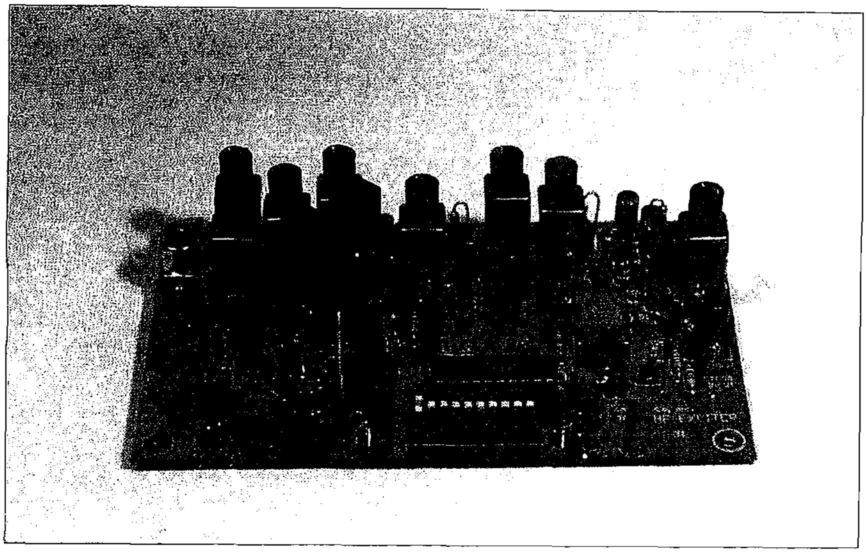

Photo A. The Hamtronics T301 board.

A foregone conclusion

Opening up the catalog, one of the members pointed out the T301 VHF FM Exciter. Two to three watts output. Continuous-duty operation. Separate audio and CTCSS inputs. Special low-noise synthesizer. Frequency accuracy of 2 ppm available, and standard on the assembled version. And it was direct FM-modulated, and could accept data rates of up to 9600 baud.

The only argument concerned whether to buy it assembled or in kit form. Some of the members felt that building it up ourselves would give us a better understanding of the transmitter, which would be helpful in future modifications. Others pointed out that the Hamtronics documentation is clear enough to get us through any future mods, and that we should get our hands on the thing as soon as possible. As it turned out, the TXCO option tipped the scale. It was pointed out that the high-stability temperature-controlled oscillator was an option for the kit, but was included with the pre-assembled module. This made the cost differential just $40 between the assembled unit and the kit with the TXCO option. This seemed like a small price to pay to be up and running as soon as we took the T301 out of the box. (Since the T301/R301 series of modules no longer uses crystals for frequency selection, Hamtronics can now provide next-day service—there's no need for custom crystals to be ground.)

Checking it out

We ordered the T301 and received it just a couple of days later. As usual, the group met at someone's shack to check it out. On first glance, the exciter looked just like what we'd expect from the Hamtronics line. The rig was built on a high-quality double-sided PC board, with an ample ground plane. High-quality parts were used throughout, including a twenty-pin surface mount device on the bottom side of the board. Our resident repairman liked the use of sockets for the ICs, a large heat sink on the PA transistor, and the use of well-marked connection points. Our resident hacker, on the other hand, was more interested in getting access to the circuitry. He liked the frequency-programming DIP switch, which gave easy access to the frequency select lines of the VCO—either for a set of switches or a microcontroller. He also seemed interested in the fact that the exciter output can be varied from two to over three watts by varying the supply voltage between 13.6 and 10 volts DC (something about a variable power output being handy in one of the "no holds barred" hunts ...).

Applying power

We soldered a few wires to the board, and were up and running in just a few minutes. Hooking up the controller (a Basic Stamp) proved to be only a slight challenge. Since the T301 is designed primarily for repeater service, it doesn't have a separate PTT line. The unit is in transmit any time power is applied. We simply provided a transistor switch to supply B+ to the exciter, operated by the controller. We did notice that there is a provision to keep the synthesizer running at all times, and to cycle B+ to the RF stages only. This is because there is a slight delay as the onboard microcontroller boots up and initializes the synthesizer, and there might be a small loss of voice or data during this time in a repeater installation. The solution to this is to keep the synthesizer powered continuously (about 30 mA) and key the transmitter as needed via the B+ (about 550 mA). In our case, we didn't need lightning-quick key-up, so we simply cycled power to the entire board and made sure the controller assumed a half-second or so key-up time before it sent any Morse Code.

The Hamtronics T301 checked out quite well on the bench, and we hope to be chasing it as soon as the last of the snow clears away. Last seen, the rig was being sized to fit into the base of a clay flower pot, with a dipole draped through the branches of a dead shrub that was mounted right in the pot. (Hmmm. Not sure if I was supposed to let that out of the bag or not ...)

The Hamtronics T301 comes in several models, with band splits that cover most ham and commercial bands. It is available from Hamtronics, Inc., 65-D Moul Road, Hilton NY 14468-9535. Phone: (716) 392-9430. E-mail: [jv@hamtronics.com]. A complete catalog also is available on their Web site [www.hamtronics.com].

Home-Brewing a 3 kW+ Dummy Load

Corral some Cantennas to check out your big gun amplifier.

Ronald Lumachi W2CQM
73 Bay 26th Street
Brooklyn NY 11214-3905

Take a look at the output ratings of the new-generation high-power linear amplifiers, and you'll soon know full well why the oil-filled, gallon-sized, once-venerated Heath Cantenna® 1000 W dummy load is now way out of its class. Even a couple of 3-500Zs loafing along under test will cause the oil to boil and overflow. Imagine what a pair of 8877s will do under lock key! You could probably fry some of the Colonel's chicken to perfection when pushing the pedal to the metal with these tubes.

There are far more economical ways to prepare these culinary delights, but alas, there are few inexpensive alternatives to the dummy load for off-the-air testing of today's powerhouse amps. Consequently, big ticket and key-down carriers abound on all the frequencies—to the consternation of the rag-chewers and net controllers.

By default, the antenna provides the only easily accessible cheap place to dump large doses of RF during tuneups. But just because many amateurs do it, that doesn't make it right! Admittedly, yours truly was briefly a member of that group, but I was not at any time during that period pleased with what I had to do to test my amplifier decks. Because of my uneasiness, I began to consider some of the alternatives to QRMing the world.

Here's one idea that you might think worthwhile. It's based on the adage that *one man's feast is another man's famine*. Although I hate the use of this cliché, it is true and relevant in this project. If you'd like to see how this relationship correlates to building a dummy load from Heath Cantenna discards, read on—I promise that you will be pleasantly surprised.

Yes, there is a better (and less expensive) way!

The consensus of radio amateurs regarding on-the-air testing is unanimous in favor of its elimination. However, it's not realistic to expect the average brasspounder to lay out big bucks to buy a commercially built water-cooled dummy load. It's simply not a cost-effective purchase. Besides, the conventional thinking is that if you tune up on the air, you're only on for a brief time. In the worst case, you're only disturbing a couple of people.

The bottom line is that on-the-air testing remains the cheapest game in town and, more important, you'll get away with it simply because no one will know that it's you causing the interference. Fortunately for the majority of us, most hams are more highly principled, and always on the alert for a better way to test their finals. I'm convinced that a sensible, rationally priced, easily duplicated alternative will get the boys on the ham bands to clean up their act in a heartbeat.

No one knows how many Heath Cantenna dummy loads are out there languishing under benches simply because they can no longer cut the mustard. The high output of the modern amplifier, developed as a result of the FCC's new definition of "legal limit," resulted in the Cantenna's demise. This old friend can no longer handle the new power levels safely.

To prove the point that the Heath units are in disfavor, walk the hamfests and check out the large numbers of Cantenna discards, the dummy load heroes of yesterday, with \$5–\$15 price tags on them. With that availability and cost factor in mind, think about this scenario for a moment: What if you were able to connect up a bunch of these Heath has-beens safely in order to accommodate a higher absorption level of RF power, for a fraction of the

Photo A. The 3 kW dummy load all dressed up and ready to go. The optional circuit with the RF (top) and the relative output meters have replaced the Heath minibox on the lid of the gallon container. The meter chassis was mounted vertically so that the rear panel could be removed for convenient access to the circuitry. The sensitivity control and the SO-239 are located on the top of the enclosure. The open-frame 115 VAC gearhead motor, driving the paint stirrer at 200 rpm, is located to the rear. The two forlorn Heath discards have, in a sense, donated their vital organs to give their big sister a new lease on life.

cost of a commercial dummy load? Would you give it a try? The answer is obvious!

It can and has been done (see **Photo A**). If you decide that this is a viable project, buy as many Cantennas as you can (for a total of four). But while negotiating and attempting a meeting of the minds with the seller (haggling), don't divulge the reason for the purchase. You'll want to keep the price low. Keep in mind that the first principle of economics dictates that the demand for an item and its price are directly related.

Here's where some acting skills can help. Be as nonchalant as possible when making your best deal and avoid tipping your hand about what's up your sleeve. As a matter of fact, continually question rhetorically (and vociferously in the Shakespearean tradition) the sanity of your purchase and repeat, as often as necessary, that you are probably making the mistake of your life. Crocodile tears at this point would be a plus. Remember, the tailgaters are a slick bunch, and if there's any hint of your true motivation for the purchase, I can assure you it will be reflected instantaneously (you know which way) in the price.

By the way, bring a pocket VOM with you to check for continuity and resistance. Don't be alarmed if the meter reads an open circuit. Heath used a robust 50-ohm non-inductive resistor but made the internal connections with some rather thin-gauge silver-plated copper. It's probably the flat stock rather than the resistor that's bad. Use this fact to drive the price even lower and to demonstrate further that your sanity remains in serious question. What you want to do in this charade is to point out that it's foolish to purchase ham equipment that's defective. Remember, it's all done in fun and a successfully wrought deal enhances the hamfest experience for both parties.

Those who don't enjoy this style of bazaar negotiating may then direct their energies to other pursuits and advertise their Cantenna needs on the Internet, BBS bulletin boards, or reflectors. I've been down that route, and the number of responses will surprise you. Shipping is not really a problem. In order to make certain that the mineral oil (it's harmless) doesn't leak out,

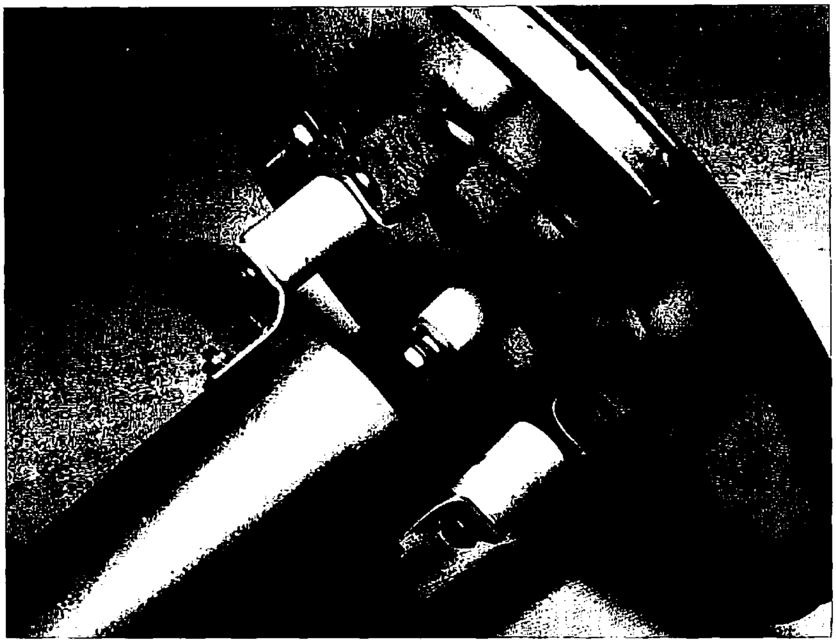

Photo B. *A close-up view of the resistor support structure. Note that the two threaded insulators are blocking the return path to ground. The two aluminum supports have been cut, drilled, and bent to shape to accept the insulators. If you are unable to locate the insulators, snip off about half an inch of aluminum and replace that length of material with a strip of Plexiglas™. The porcelain feedthrough insulator transfers power from the source to the base of the resistor. Note how the U-shaped bracket, connected to the base of the resistor and centered in the aluminum tube, is bolted to the feedthrough. The spring-loaded bolt assembly above the insulator is the original pressure relief valve in the event of boilover.*

remind the seller to securely tighten the lid and place several lengths of duct tape around the perimeter of the can as well as over the spring-loaded safety vent. Wrap the gallon container in a heavy-gauge plastic bag, and provide enough cushioning in the shipping carton to prevent damage. For whatever it's worth, mark the carton *THIS SIDE UP!* The alternative is to empty the mineral oil into a separate plastic container. The shipping charges will be the same, but the carton will be slightly larger.

What's next?

After you've accumulated your Heath Cantenna stockpile, disassemble the units by prying off the lids. Make certain you have several layers of newspaper on the floor to absorb the mineral oil drippings. Allow the resistor assemblies to drain. Pour the oil from the individual Heath gallons into an empty plastic five-gallon pail that's been scrubbed clean. The container best suited for our needs once held gypsum board taping compound, but a five-gallon pail from paint or laundry detergent is OK. If you're a home handyman, you've got them around. If not, check out a new home construction site when the painters are just about finishing up and help yourself (with permission) to one of the many in the pile. Make certain you get a lid that fits securely and has a large flat surface for mounting the components.

Before you dump in the oil, fit a piece of metal screening to the inside top, sides, and bottom of the pail. I was fortunate to have some remnant aluminum decorative radiator enclosure mesh for the project, but a small length of aluminum or copper mosquito screening works equally well. It's available off the roll at your local hardware store or home center. Through-staple the screening where it overlaps itself in order to provide support, to maintain its shape, and to confine the RF. You'll want to keep the radiation within the pail in order to comply with both the spirit and the letter of the new FCC regulations that limit the levels of permissible exposure around the shack.

You may be wondering why "4" is the magic Cantenna number. First, it's impossible to find a single megapower, noninductive 50-ohm resistor. The alternative is to use our knowledge of the properties of resistance in electronic circuits to attain the power levels we need at the correct input value.

So, four series/parallel 50-ohm Cantenna resistors coupled with five gallons of a circulating cooling medium (more on that later) solve the problem. Remember, two resistors of equal value in parallel reduce their resistivity by one half, but double their current-handling capabilities. (Two 50-ohm resistors in parallel = 25 ohms.) Add the value of resistance when they're wired in series. Consequently, a unit of two paralleled resistors (25 ohms), connected in series with an identical pair of paralleled resistors (25 ohms) add up to 50 ohms with increased power handling capabilities. Sounds like a win/win situation to me. All that's left to do is to dump the four of them into the pail and fire away.

Just kidding! There's a bit more to do ...

Only one of the stock Heath resistor/support assemblies will be used almost intact. (A variety of other mechanical resistor mounting configurations may be employed to achieve an identical series-paralleled result. If you elect another procedure, make certain the resistor assembly brackets extend a sufficient distance from the mounting plate such that the bank of resistors is fully immersed in the cooling oil.)

Pick out the one that appears to be in the best condition. Verify that the resistor is not open and that it reads 50 ohms. Begin by interrupting the return path to the top of the metal lid and the SO-239 ground by cutting the two aluminum brackets in half and installing two porcelain half-inch threaded insulators. Tin snips work well here. You'll find it easier to drill the two holes in

Photo C. The second 50-ohm resistor is shown placed in parallel with the main support structure. The base is held in place with a short length of copper bridging bolted to the feedthrough insulator on one end and the U-shaped bracket of the resistor on the other end. The top support is fashioned from a length of copper stock. Note how the resistor collar is held in place with the hardware. Use one of the four threaded centering devices to attach the top brace to the aluminum tube. When you're through with the hookups, center the resistor within the tube and secure with the locking nuts. At this point, the resistance from the SO-239 input to the base of the two paralleled resistors should read about 25 ohms.

each support for the insulating porcelain attaching bolts before snipping (see **Photo B**). Bend each support at the mark and reconnect, using some small bolts and lock washers. If locating the mini-porcelain units is a problem, snip away about half an inch of aluminum and replace it with a length of Plexiglas™ and some nut/bolt hardware.

At this point, you're just about where you started from mechanically, except that you now have an open circuit with continuity only from the center conductor of the SO-239 to the base of the resistor. Remove a resistor from a second Cantenna support assembly, keeping the top portion of the resistor intact. Cut a suitable length of copper flat stock for use as both a mechanical and electrical bridge across the top of the two resistors. Drill a hole in either end. Bolt one end onto the feedthrough insulator, using its hardware.

On the other end of the bridging material, use a small nut, bolt, and washer to connect the second resistor to the primary assembly. Remember that you left the upper U-shaped mounting straps in place to ease this hookup. Cut a second length of copper flat stock approximately six inches long. Form a collar around the bottom end of the second resistor. Drill a hole and secure the collar with a nut, bolt and lock washer. Mark and drill a hole at a point along the copper mounting strip that corresponds to the location of one of the four bottom support nut/bolt locking assemblies. They're located on the base of the aluminum tube that surrounds the main resistor.

Remove one of the bolts (along with the locking and positioning nuts) and pass it through the hole in the copper strip. Reinstall the assembly, making certain that the nuts are positioned correctly. The two resistors are now in parallel. If necessary, adjust the four set screws to ensure that the resistor is centered within the aluminum tube. Snug them up and tighten the lock nuts. You may want to use a dab of

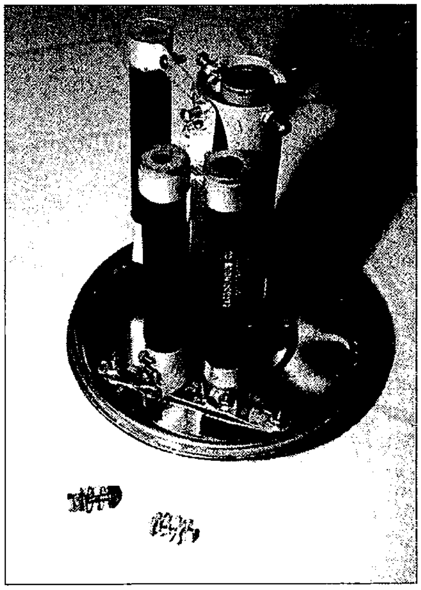

Photo D. The four resistors are series-paralleled and secured to the original gallon lid with hardware. The two front resistors have been bolted together at the top with one set of nuts and bolts. The base of this pair has been bolted to a length of copper and firmly attached to the lid. This is the ground return, so it might be a good idea to solder all the junction points. The extra length of strapping that parallels the resistors in the rear has been shaped, drilled, and double-bolted into the junction of the two front resistors. The two spring-loaded overflow valves will be installed in the lid after drilling a one-quarter-inch hole for an extra margin of safety venting in the event of boilover.

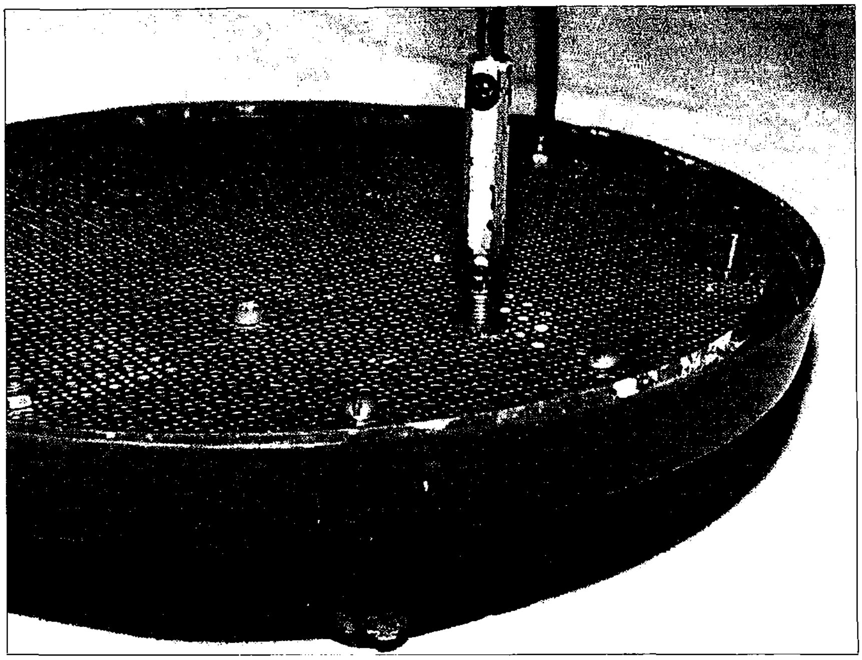

Photo E. The gearhead motor is visible below the plastic five-gallon cover. The shaft passes through the lid via a small one-quarter-inch brass bushing. Use a one-quarter-inch coupling to attach the motor shaft to the paint stirrer. Note how the metal mesh has been fitted to the inside of the cover to contain the RF. The two (of five) sets of hardware visible to the right secure the mesh to the cover. The three (of four) roundhead bolts visible in the foreground secure the motor to the lid. It may be necessary to trim the stirrer's length in order to fit.

Loctite™ to keep them from loosening from vibration.

Take a minute to check continuity and resistance from the center conductor of the SO-239, mounted on the lid, to the copper flat stock extension at the far end of the two paralleled resistors. The VOM should read very close to 25 ohms (see **Photo C**). It may not be a bad idea to solder all the connections at the bridging junctions.

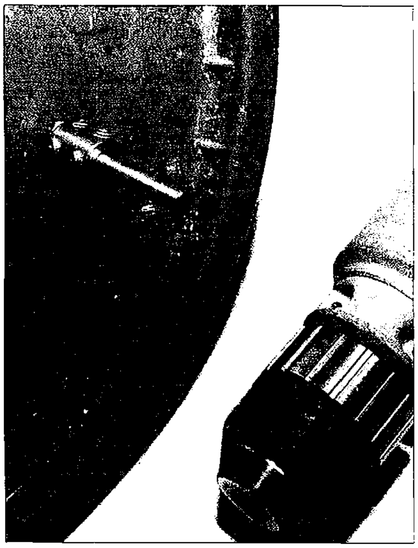

Photo F. *If you prefer not to install the gearhead motor, pass the stirrer through the bushing from the inside and secure the coupling to the shaft as a stop. Use your hand-held drill to circulate the oil.*

You're well on your way!

Remove the remaining resistors from the two Heath Cantenna assemblies. (While you're at it, disassemble the spring-loaded pressure-relief overflow valves. These units consist of a bolt, lock nut, spring, and composition washer. Drill a couple of quarter-inch holes in the metal lid for at least two additional safety venting valves, in the remote chance of overflow due to boiling.) Remove the hardware from the two resistor collars and loosely bolt them together at one end using one set of existing hardware. You'll find that bolting the two collars together in this manner is a very convenient method to parallel the second set of resistors.

At the other end of the paired resistors, bridge the two U-shaped support brackets with a length of copper strip about four inches long and bolt the resistor supports to the strip. Drill two mounting holes at each end of the strip and secure this assembly to the metal lid. Keep in mind that it's a good idea to solder all mechanical connections whenever possible.

This completes the ground return path of the circuit. You'll remember we used only a portion of the six-inch length of copper strip to connect the first resistor to the aluminum housing. Trim and shape the excess length of that strip and align the end with the upper portion of the second set of resistors where the two collars join. You'll have to drill two closely-spaced holes for through-bolting at that end.

Once these three assemblies are firmly bolted together, the two paralleled sets of resistors are in series and the circuit is complete (**Photo D**). Solder the junction point as insurance for a good electrical bond. Check your work with the VOM on the resistance scale for an input value.

The original Heath resistors have a manufacturing tolerance of ±10%, so a value of approximately 50 ohms can be expected. You'll need to know this precise resistance value if you decide to install an RF current meter to calculate power using the formula $E = I^2R$. A discussion of this option is presented in the sidebar.

The remaining steps in the assembly are a snap. Using tin snips, cut a hole in the top cover of the five-gallon container, slightly smaller than the diameter of the metal lid. Remember, there's mesh fitted to the inside cover, so cut through that material also. Center the lid and resistance assembly over the hole in the cover and secure with at least four sets of nut/bolt hardware.

In order to achieve maximum cooling efficiency from the five gallons of mineral oil, I installed an auxiliary system to circulate the oil and speed up the natural cooling convection of that fluid. To accomplish this cheaply and efficiently, I used a 200 rpm (115 VAC) gearhead motor bolted to the plastic lid of the container. [This motor is #5-1155 (200 rpm) and sells for $4.99 from Surplus Center, 1015 West "O" Street, Lincoln NE 68501-2209; tel. (800) 488-3407.]

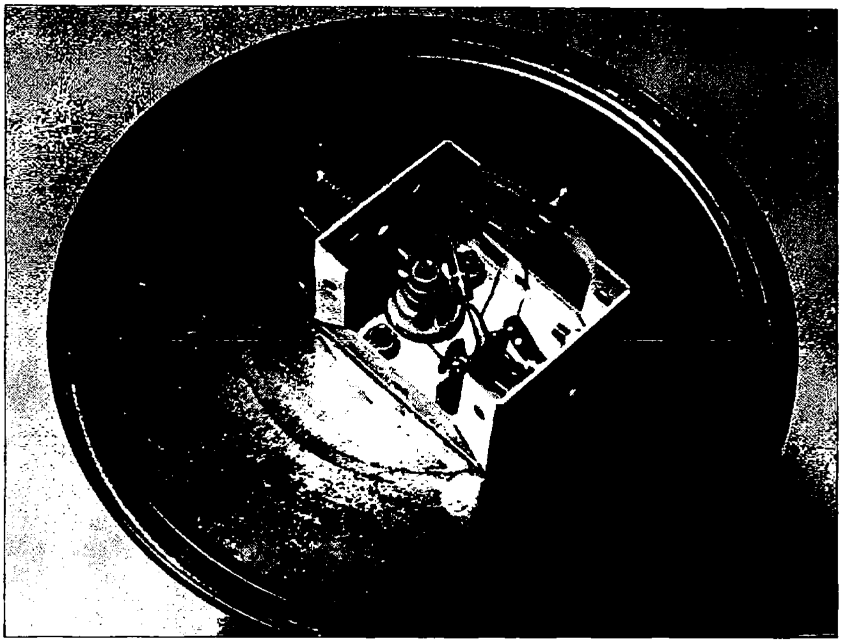

Photo G. A view of the stock Heath Cantenna input circuit. Leave this system intact if you prefer not to install a monitoring circuit. The small disk to the upper right of the minibox is the spring-loaded safety valve. The electronic components in the original Heath design accommodated a relative output meter through the RCA phono plug mounted opposite the SO-239.

With the shaft protruding through a quarter-inch feedthrough bushing, use a one-quarter-inch set screw coupling to connect a metal paint stirrer device (available at any home center for about $2) to the motor shaft (see **Photo E**). I had to trim the stirrer about three inches because it was a bit too long. All that's left to do is plug it in and start stirring.

If you prefer to eliminate the small motor, pass the stirrer shaft through the bushing to the outside and secure the coupling to the shaft of the stirrer as a stop collar. This will prevent the shaft from falling back into the pail. Attach a drill at this point to get the shaft and blades spinning (see **Photo F**).

That's about all there is to get the show on the road, except that you'll need an additional gallon of mineral oil to top off the five-gallon container. Your local pharmacy stocks this item. I elected to add two meters as a means of enhancing the monitoring capabilities of my dummy load. More on that in the sidebar.

If you're staying with the Heath input circuit, then a series-installed, suitably scaled, commercial wattmeter is absolutely necessary to check output (see **Photo G**). A Drake™ W4 or a Bird™ 43 (with a 2500 H–5000 H element) will handle the task with ease. Tune for maximum output and read the power directly off the scale.

If you elect to add the option of the two meters, determining output requires a simple calculation involving some multiplication. Tune the amp for maximum output on the relative output meter. Adjust the sensitivity pot on the meter chassis for a bit less than full-scale deflection. You'll want to see exactly at what point the meter reaches its maximum deflection and then begins to drop off.

At that instant, note the value of RF current on the second meter. Apply that number to the formula $E = I^2R$ (E = power, I = current, R = resistance) to calculate output power directly. For example, assume that in a test of an amplifier final, the RF meter deflects to "6" and it has been determined previously by VOM measurement that the input resistance of my dummy load is 52 ohms. I substitute these values into the formula (6 x 6 x 52) and the result is 1872 watts of power into a nearly

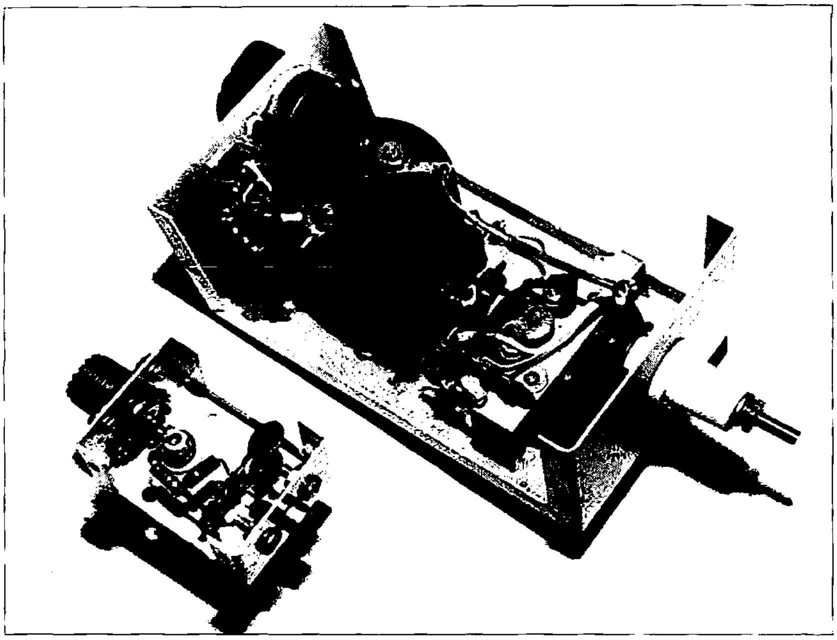

Photo H. A view of the new minibox with the two meters installed. The Heath component in the foreground will not be used in this installation. The sensitivity pot (upper right) is in the relative output metering circuit. The feedthrough to the right eventually will pass through the gallon lid and support the resistor assembly immersed in the oil coolant. The cluster of small parts to the lower right is the remainder of the relative output circuit components. Note the #14 bus bar from the output of the RF meter to the top end of the feedthrough insulator. Circuitry is not critical, so don't hesitate to pack the components in a small space. The choke pictured to the upper left was omitted from the final circuit, so you eagle-eyed hams out there need not be upset that it doesn't appear in the schematic.

perfect resistive load. It's as simple as that!

If you prefer to save yourself the hassle of making repetitive mathematical calculations each time you use the dummy load, prepare a solution sheet in advance. Solve the equation for a list of typical RF values and tape the solutions to the container.

By George, I think she's got it!

You may recall the movie *My Fair Lady,* in which an uneducated, ill-mannered, slovenly woman from the street was miraculously transformed into a cultured, well-spoken, socially acceptable member of society, through the efforts of an oddball language professor. Now that I've completed this project, I feel a little like Professor Higgins of movie fame. I was fortunate in having a Colonel Pickering counterpart in Lou W1QJ, who set the project on course by pointing out several shortcomings in my initial approach to the circuit details.

Now, you too can share this feeling of accomplishment. Search out four Cantenna dummy loads. With a minimum of effort and expense, retrofit the components from those salvaged assemblies to this project. As a result, you'll create a new and more powerful piece of ham shack gear, with both utility and extraordinary power-handling capabilities. When you're done, name her *Eliza Dolittle,* and if you're so inclined, change your on-the-air handle to "Professor Higgins." Good luck on the project, and I'll see you down the line!

Optional Metering Panel

It's certainly convenient to have a spare wattmeter series-connected to the dummy load at all times—especially when you want a quick amplifier check. Some amateurs even hardwire the wattmeter and dummy load into the output circuit of the amplifier via a tap on the antenna selector switch. You can't beat that for accessibility. Unfortunately, high-power wattmeters are an expensive luxury when they're used only occasionally. An alternative is to permanently install two relatively inexpensive meters into your 3 kW+ Cantenna dummy load circuit. The addition of these two monitoring devices will provide the information needed to assess an amplifier's output.

Search out an RF ammeter rated at six to eight amperes. Make a hamfest visit for this meter ($3 to $5, usually). Otherwise, check availability and prices with Surplus Sales at [www. surplussales.com] or E-mail [grinnell @surplussales.com]. This little gem reads RF current directly in amperes through an internal thermocouple. Substituting the meter readings into a simple mathematical formula determines the actual RF power output to a known resistive load.

The second monitoring device is a garden variety 1 mA full-scale meter wired to read relative output. Any logging scale will do just fine, since its purpose is to read maximum deflection only. As a matter of fact, look specifically for an odd scale. The price will be cheaper.

If you want to keep expenses low, select two-inch meters. Don't hesitate to pack the components into a small metal enclosure (see **Photo F**). Circuitry is not critical! The RF meter is wired in series with the center conductor of the coax cable from the linear. Use #14 copper wire from the SO-239 inner contact point to one of the meter terminals. Complete the circuit by connecting a second length of #14 wire from the second meter terminal to a solder lug at the top end of the porcelain feedthrough insulator (salvaged from one of the Cantenna mini-enclosures).

There are no high-current concerns when wiring the second meter into the circuit, so light-gauge hookup wire is OK; however, this meter requires a few more parts.

Basically, what's happening here is that a minuscule amount of RF current is sampled through a resistor. It's rectified by a small diode and fed in a controlled manner through the sensitivity potentiometer directly to the "+" terminal of the relative output meter. From the schematic (**Fig. 1**), follow the path of the DC potential and the wiring will be a breeze.

To use the system, adjust the sensitivity control for about 3/4 meter scale when under load and fine-tune the amp for maximum deflection. Once that control has been set, it probably will never have to be readjusted. At the moment of maximum meter movement, note the value of the RF current analog scale and apply that number to the formula $E = I^2R$. Don't worry if math intimidates you. Simply multiply the numerical value of the RF meter readout (I) by itself (I^2), and then multiply that product by the pre-determined input resistance of your dummy load.

Life would be so easy if the RF value happened to be a nice round number and your dummy load was exactly on the money at 50 ohms. Unfortunately, Murphy and his vexing laws are not that accommodating. Note the value of the RF meter readout along with the resistive value of the dummy load, plug those figures into your pocket calculator, and let *it* do the number crunching.

To illustrate the point, run these hypothetical values to check out the formula: RF current 4.8; Cantenna resistance 52.7 ohms. Using the formula $E = I^2R$, substitute the meter readout values and solve (4.8 x 4.8 x 52.7 = 1214.2 watts). It's as easy as that.

If you agree that built-in monitoring makes good sense, find a metal enclosure for the components. Mount the meters, wire up the circuit, and through-bolt the enclosure to the metal lid supporting the dummy load resistors. Obviously, you'll have to remove the original Heath-installed mini-enclosure. Good bonding is essential at these points to ensure a zero-resistance ground return path. Use at least three through-bolts with star washers (internal teeth) for the best metal-to-metal bond you can get. Hook up the input of the first set of paralleled resistors to the output side of the feedthrough porcelain insulator to complete the wiring.

If you recognize the utility of an in-line metering console and realize that it has additional value as a portable through-line monitoring device, then consider this hookup. Construct the console in the regular manner following the schematic. Instead of using the porcelain feedthrough on one end, replace it with a second chassis-mounted SO-239. To hook it into the dummy load, use a double-ended PL-259 (Radio Shack #278-192) connected to the lid-mounted Heath Cantenna minibox input you've left intact.

When all the dummy load testing is completed, remove the metering station and position it in series on your coaxial line to continually monitor output to the antenna. Keep in mind that the use of the formula $E = I^2R$ for accurate power output indication requires a known value of antenna input impedance. You can always assume manufacturers' specifications (with some wariness) or consider using an antenna bridge. The MFJ-259 or the Palomar RX100 will work well. Either of these two handy devices determines the exact resistance in ohms. That value can be substituted into the formula when it signals that the array is at resonance and the load that's displayed on the meter is purely resistive.

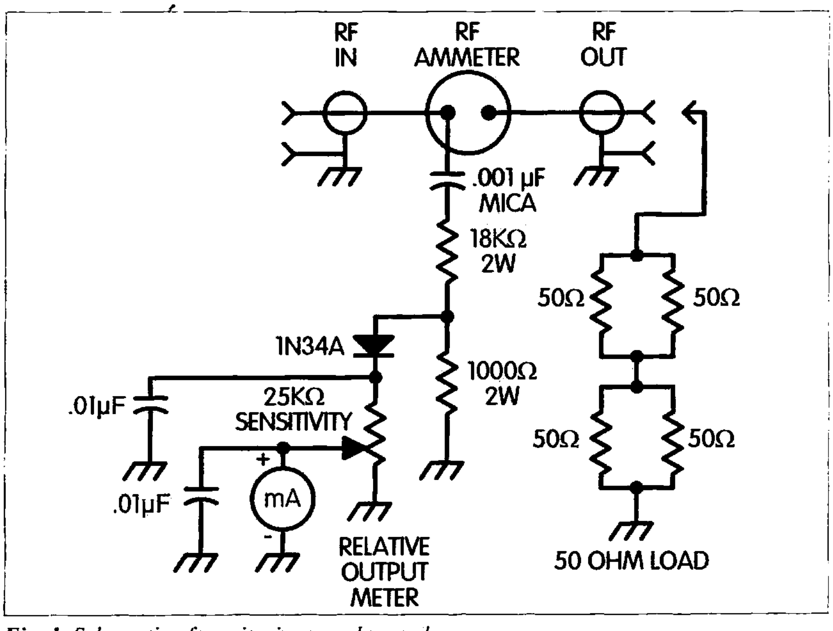

Fig. 1. Schematic of monitoring panel console.

Networking with Thevenin and Kirchhoff

Helpful friends when you go into analysis.

Parker R. Cope W2GOM/7
8040 E. Tranquil Blvd.
Prescott Valley AZ 86314

Network analysis isn't about lying on the couch of a network of psychiatrists, but it could lead to that. Network analysis is the process of determining the voltage across an impedance or the current in it that is so essential in the design or analysis of any circuit. Sometimes the answer is obvious, but other times it's obtuse, or so it seems. Don't despair; there are only a couple of laws or theorems needed to let the light shine through. The laws are few and simple, but depending on your facility with algebra, one may be easier to use than some other. In any case, the laws and theorems are essential to network analysis.

The basic laws, really axioms, are the two Kirchhoff's laws. Axioms are self-evident and universally accepted truths: Kirchhoff's voltage law states that the algebraic sum of all the voltages in a closed circuit is zero. That is to say, the sum of the voltage drops around a circuit is equal to the voltage(s) applied to the circuit. The current law states that the algebraic sum of the currents into and out of a point is zero. That is, there is as much current flowing away from a point as there is flowing toward it. From these laws, several theorems have been developed. Theorems are demonstrably true based on the accepted assumptions. In the case of network analysis, Kirchhoff's laws are the accepted assumptions.

There are a few theorems derived from these axioms that reduce a complex network to a more manageable equivalent circuit. Thevenin's theorem, Norton's theorem, and the Superposition theorem are the workhorses. Of course, the loop equations for Kirchhoff's laws can be written and the simultaneous equations solved, but that usually takes a bit more effort.

Thevenin's theorem is useful in reducing a complex network containing many elements to a single constant voltage generator with a single impedance. The theorem states that any network can be replaced, with respect to any two external terminals of the network, by an equivalent network that consists of a voltage generator with an internal impedance that is equal to the impedance measured between those two points when all of the generators in the network are replaced by their internal impedances. **Fig. 1a** shows the general Thevenin's network. **Fig. 1b** shows the DC network equivalent. **Fig. 1c** shows the equivalent network providing bias for a transistor.

For example, if it is desired to find the current that will flow in the base of the bipolar transistor with $V_{BE} = 0.6$ V when biased with the circuit of **Fig. 1**, Thevenin's theorem shows the way. The voltage E_G of the equivalent generator at the junction of the 6.8 k and the 2.2 k is:

$$E_G = 9 \times 2.2\text{ k}/(6.8\text{ k} + 2.2\text{ k}) = 2.2\text{ V}$$

and the equivalent generator R_G resistance is:

$$R_G = (R_1^{-1} + R_2^{-1})^{-1} = (6.8\text{ k}^{-1} + 2.2\text{ k}^{-1})^{-1} = 1.662\text{ k}$$

Therefore, when the base junction is connected to the junction of R1 and R2, the current in the base will be

$$(2.2 - 0.6)/1.662\text{ k} = 0.962\text{ mA}.$$

Norton's theorem is useful in the solution of network problems in which it is necessary to reduce a complex network to an equivalent network consisting of a constant-current generator shunted by a single impedance. This

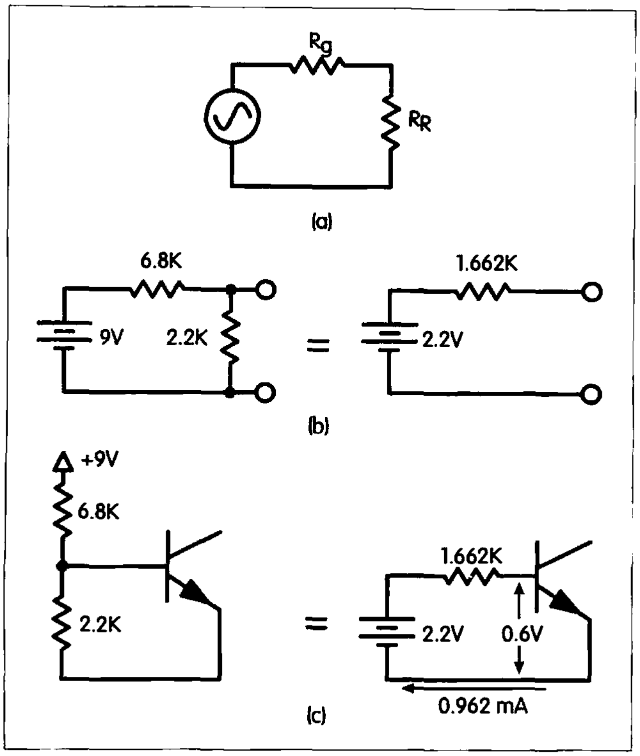

Fig. 1. Thevenin's equivalents. (a) General Thevenin's network. (b) DC network equivalent. (c) Transistor bias equivalent circuit.

equivalent circuit consists of a constant-current generator with infinite internal impedance, whose generated current is equal to the short-circuit current I_{sc} measured between the terminals of the original network in shunt with the impedance Z_G (or admittance Y_G) seen looking back into the original network from the terminals when all generators are replaced by their internal impedances. Norton's theorem is similar to Thevenin's theorem except that current sources are used instead of voltage sources. When a constant-current source I_{sc} is shunted by a resistor r_g, the voltage across the generator is $I_{sc}r_g$ and the generator's internal impedance is r_g. The Norton generator is then equal to a Thevenin generator with a voltage $E_G = I_{sc}r_g$ and a generator internal resistance of r_g.

Norton's theorem is not as commonly used as Thevenin's because we usually think in terms of voltage sources, not current sources. However, there are some devices that approximate a constant-current generator: The drain of an FET approximates a current

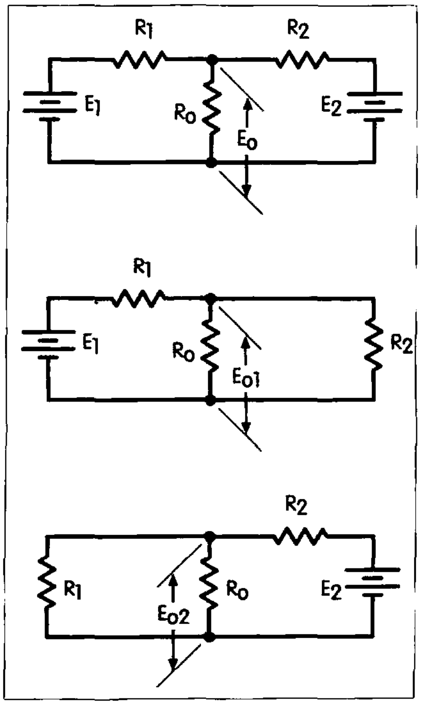

Fig. 2. An arbitrary network with two generators.

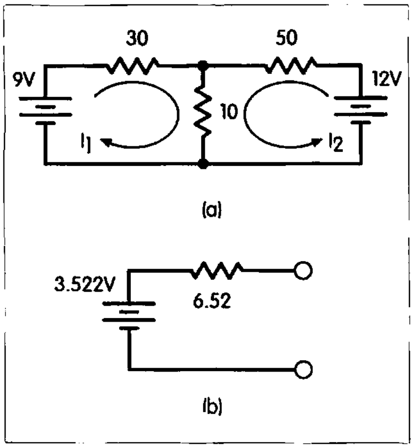

Fig. 3. A two-source network can be solved with Kirchhoff's laws.

source when the transistor's drain-to-source voltage is greater than pinch-off. The drain current is $g_{fs}V_{gs}$ and is essentially independent of drain voltage. The collector current of a bipolar junction transistor, $I_B h_{fe}$, also represents a current source when the collector is operated unsaturated.

The Superposition theorem is useful in determining the voltage across two external terminals of a complex network. The theorem states: "The current in any branch or the voltage across two external terminals distributed in any manner throughout the network is the sum of the currents or voltages which would be produced by the individual generators acting alone with all the other generators replaced by their internal impedances." **Fig. 2** shows an arbitrary network that has been divided into two separate networks, each containing only one generator. The component of the output voltage E_o produced by E_1 is E_{o1} and the component resulting from E_2 is E_{o2}. The voltage E_o across R_o is the sum of E_{o1} and E_{o2}:

Eo_1 (with E_2 shorted) = $E_1(R_o^{-1} + R_2^{-1})^{-1} / [R_1 + (R_o^{-1} + R_2^{-1})^{-1}]$

E_{o2} (with E_1 shorted) = $E_2(R_o^{-1} + R_1^{-1})^{-1} / [R_2 + (R_o^{-1} + R_1^{-1})^{-1}]$

$E_o = E_{o1} + E_{o2}$

Any number of single-generator circuits can be solved in a similar fashion.

The Superposition theorem and Thevenin's theorem make a potent pair for solving almost any complex network. The Superposition theorem produces the equivalent Thevenin's generator E_G and the Thevenin equivalent generator impedance is R_o, R_1, and R_2 in parallel or $(R_o^{-1} + R_1^{-1} + R_2^{-1 \ldots})^{-1}$.

Applying the Superposition theorem to the network of **Fig. 3** shows:

$E_{o1} = 9(10^{-1} + 50^{-1})^{-1} / [30 + (10^{-1} + 50^{-1})^{-1}] \approx 1.957$ V

$E_{o2} = 12(10^{-1} + 30^{-1})^{-1} / [50 + (10^{-1} + 30^{-1})^{-1}] \approx 1.565$ V

$E_o = 1.957 + 1.565 = 3.522$ V

Of course, E_o can be obtained by solving the simultaneous solutions of the two loop equations of Kirchhoff's law. Applying Kirchhoff's laws to the two loops of **Fig. 3** shows:

$9 = 30I_1 + 10I_1 + 10I_2 = 40I_1 + 10I_2$

$12 = 50I_2 + 10I_1 + 10I_2 = 60I_2 + 10I_1$

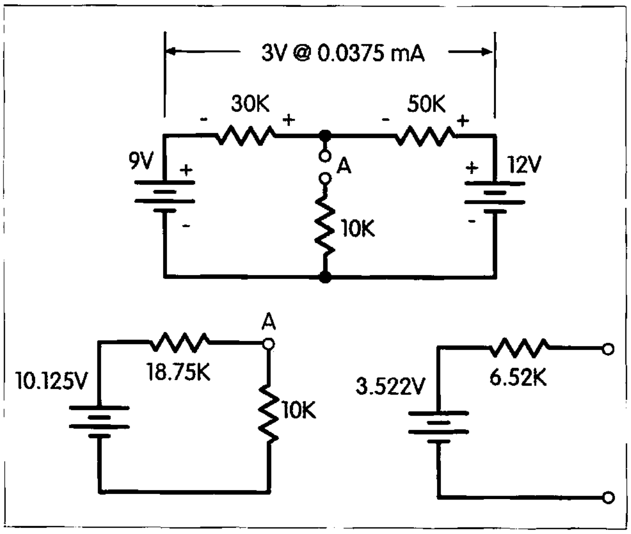

Fig. 4. Further simplifications can ease the solution of two-source networks.

The simultaneous solution of the two equations requires multiplying one of the equations by a factor that eliminates one of the terms when the equations are added. For example, multiplying the second equation by -4 and adding it to the first equation produces:

$[-48 = -240I_2 - 40I_1] + [9 = 10I_2 + 40I_1] = [-39 = -230I_2] = [I_2 \approx 0.1696]$

Substituting this value for I_2 into one of the equations permits a solution for I_1:

$9 = 40I_1 + 10 \times 0.1696 = 40I_1 + 1.696$

$40I_1 \approx 7.304$

$I_1 \approx 0.1826$

The output voltage E_o is $R_o(I_1 + I_2)$.

$E_o = 10(I_1 + I_2) \approx 3.522$, which agrees with the answer found with the superposition theorem.

The equivalent generator impedance is: $R_G = (R_o^{-1} + R_1^{-1} + R_2^{-1})^{-1}$. The solutions found with both the Superposition theorems and Kirchhoff's laws resolve into a Thevenin's equivalent of a generator voltage of 3.522 V whose impedance is 6.52.

Either the Superposition theorem or application of Kirchhoff's laws can find the E_o of a network. In some cases, a combination of simplifications is beneficial.

For example, the network of **Fig. 3** is redrawn in **Fig. 4**. The difference is that in **Fig. 4**, R_o is not connected. Application of Kirchhoff's voltage law reveals the voltage across R_1 and R_2 to be 3 V and the current through them, 0.0375.

Therefore, the voltage at point A is 9 + 1.125 = 10.125 or 12 - 1.185 = 10.125. Thevenin's equivalent circuit at point A is a 10.125 V generator with an internal impedance of 18.75. When an R_o of 10 is connected at point A, the voltage at A drops to 3.522 V, which agrees with the solutions found with

Continued on page 39

Triband Vertical Array for Big 120° Bandwidth Signal

(Or, what to do with the trap beam pieces parts in the basement.)

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The old knock on verticals has always been that they generate "an equally poor signal in all directions." It is true that the simple quarter wave vertical doesn't have the directivity or ground reflection gain of a basic dipole. It is also true that at ground level, a vertical is especially susceptible to absorption and loss from nearby homes, trees, power lines, and other foes of efficient transmission and propagation.

However, vertical polarization is the only way to generate a true surface wave (up to 50 mile radius for consistent ground communication), and for the really long haul DX, it's the most cost effective way to propagate low angle radiation. Additionally, when using a single element vertical, you will never miss hearing a rare station because your beam was headed in the wrong direction. Typically, I have found that signals coming in on my verticals are seldom strong on the S-meter. That's partly due to not having the gain of a truly directional antenna, and has something to do with what is called antenna "capture area." However, if I hear them, they can hear me. Q5 is Q5, even if I'm not 20 over S9. My experience has been, the farther away the station is, the better my chances are of breaking the pileup with my vertical and 100 watts.

First, let's consider some of the basics for a quarter wave vertical. Its radiation resistance is half that of a dipole. Makes sense, since it *is* half a dipole. A dipole up at least a half-wave above the ground will have about a 75 ohm input impedance. (For dipoles, that suggests using RG-59 feedline for the best match, not RG-8 or RG-58, as commonly used.) The other "half" of the quarter wave vertical is the "image antenna" that effectively appears when the feedline shield is connected to a good ground. If the ground is perfect, the "image" adds zero to the radiation resistance. So the load resistance should be about 37 ohms for a well grounded vertical using no tuning circuitry.

Therefore, if your RG-8 or RG-58 coaxial cable (coax) provides a 1-to-1 match to your quarter wave vertical, the ground system needs improvement! If your SWR measures about 1.4:1 going to your ground-mounted vertical, then your ground system is very good (the ideal 37 ohm load), or awful. A 75 ohm vertical input impedance will also provide a 1.4:1 ratio, but suggests you have more of a ground warmer than an antenna.

Remember, too, that for HF purposes, a good ground is not determined by how deep your ground rod is, but by how much conductive ground material you have around the vertical element, near or at the surface. I like to take a 100-foot roll of heavy fence wire, crisscross it centered at the vertical, and tack it down with gutter spout nails. It can then be covered with dirt and grass, if aesthetics are of importance. A radial layout of wires works also, but takes much more work than the wire fence approach.

With conductive terrain around you, such as Ohio farmland, wetlands, or a lake, the vertical can be the best DX antenna you would want, at least within reasonable budget restraints. And remember, a ground-mounted vertical keeps both your feet on the ground for all critical adjustments—making it an excellent all-season antenna to use and maintain. Just brush the snow back a few inches from the base in the winter, and expect improved ground conductivity. No end insulators to break down in the rain or ice. The feedpoint

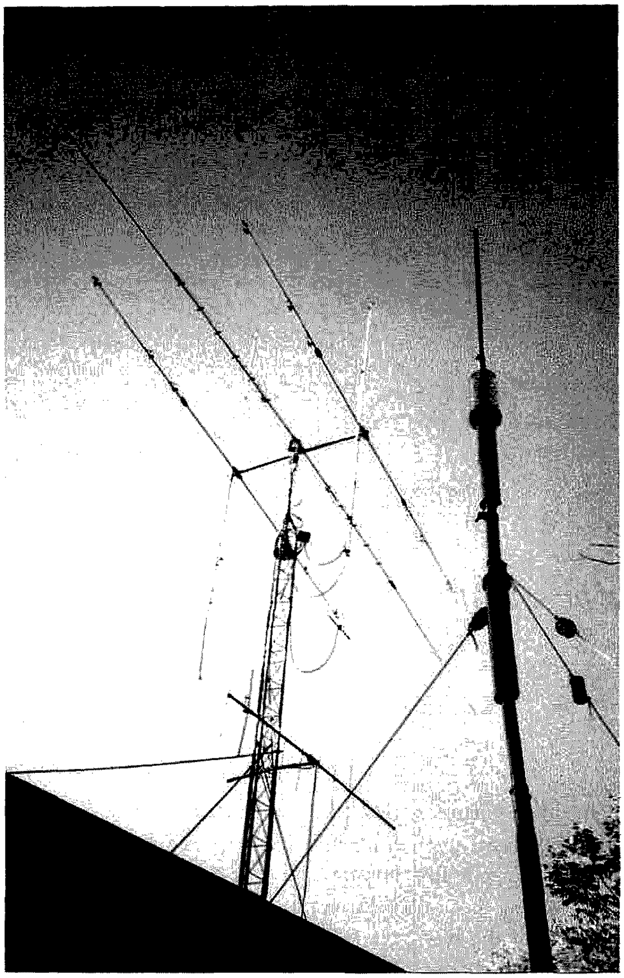

Photo A. WZ8A vertical and quad used for comparative signals.

insulator needs to withstand less than 250 volts running the maximum 1.5 kW output, and less than 70 volts running barefoot.

Speaking of voltages on the vertical: One of the concerns with a vertical is that without some sort of fence (preferably wooden) around it, the radiating element can present a hazard. Running 100 watts to a vertical implies an RMS voltage at the antenna base of 60 to 70 volts. Not that serious a shock threat, although touching it above the base means higher voltages and a definite possibility of "frostbite" (RF burn). Most hams have had one or two of those blisters before, but a neighbor with an attorney friend might not take such things so casually—especially if it's a child who gets nipped. With an amplifier, the base voltage can go above 200 V_{rms}—a definite safety hazard. So put a wooden fence around the base of your vertical, and use the fencing to provide an anchor point for the light guy-string support of the vertical element needed in windy weather. Do not make someone's lawyer richer over an RF nip.

I took a big bite from RF when I was 18, while adjusting a variable antenna link with the transmitter activated. Touched about 200 watts of RF sitting on the 1.8 kV going to the plates of my two 814s (old-time pentodes). My muscles shot me back into the wall about 6 feet behind the transmitter. The crack my elbow took on the wall momentarily kept my mind off the RF and electrical burn.

After the pain subsided in my elbow, the doctor got to look at my hand. "How *did* you get that? I've never seen such an interesting burn." That was all the "sympathy" I got from good ol' Doc. It looked like a jagged lightning bolt had left its imprint on the side of my left hand. Doc suggested that I not repeat whatever I did to earn my pain.

As far as your backyard antenna goes, there should not be any 1.8 kV of DC attached to it, and the RF voltage drops quickly when someone detunes the antenna with a finger or a hand. So touching a hot vertical should not normally be lethal, but it's still not fun to get "bit." Running 50 watts to a vertical (as in the case of running 100 watts to a pair of phased verticals) should be safe. Otherwise, invest in that fence for safety's sake.

In Novice days, I would tune the gamma match to my 10-meter beam by leaving the transmitter on low power, holding the driven element with my healed left hand, and tuning the series capacitor for maximum burn. As the RF got hotter, I would slide my hand in toward the feedpoint to reduce the hurt and the detuning caused by the hand. Maybe that's why my hair was receding in high school. Don't do that with your vertical. Adjust your antenna length using a reflected power (SWR) meter. Meters are cheap these days; try Radio Shack or your local amateur radio store. Most radio handbooks show a simple SWR meter that can be built with a handful of parts.

I wrote a C program to assist my calculations for the phased vertical array. The HAMVERTS program calculations for E (vertical element length) should be close enough that meter tuning is not a necessity. However, adjusting the element length for the measured SWR minimum does give you the exact resonant point you desire. Nearby metal objects can make the actual resonant length shorter than calculated; the program takes into account the width of the tubing, which also affects the electrical length.

The purpose of the HAMVERTS PC program is to easily generate the exact quarter wavelengths you need for any frequency. There are actually three 1/4 wavelength values generated for any given frequency: 1) the antenna 1/4-wave element length, which has the width or end effect factored in; 2) the coax 1/4 wavelength, which takes into account the "velocity factor" of the coax; and 3) the "free space" 1/4 wavelength, which is used to space the element distances. Before discussing the HAMVERTS.C program further, let's discuss a directional vertical.

The 90°x90° phased vertical is easy to construct, provides significant gain (4.5 dB), and has a broad (120°) half-power bandwidth. Its cardioid (heart-shaped) pattern provides about 20 dB of side attenuation and 30 dB of rear attenuation. So for working one continent, such as Europe—two elements directed at 45° (NE) works all the counties very nicely from Ohio. As a regular Worked All Europe contestant, I like that broad bandwidth gain feature.

The array takes two verticals, both tuned to the same resonant frequency, with a free-space separation of 1/4 wave (90°). The second driven element has an extra 1/4 wavelength of coax to delay the RF power to it. So, by the time the power going to the first element propagates to the second element, the second element power is exactly in phase with the energy coming from element 1 (1E). Conversely, by the time the energy from element 2 propagates back to element 1, the energy from element 2 (2E) is exactly out of phase with the power being radiated by element 1. Obviously then, the peak radiation will occur in the direction of element 1 toward element 2, and on. Looking back from element 2 towards element 1, there should be almost perfect cancellation. This is what creates the cardioid gain pattern.

Measured coax lengths provide the 1/4-wave time delay essential for phasing the two antennas. Think of the coax as many sections of small inductors (the center wire) and capacitors (the braid and center conductor, with a plastic or foam dielectric separating these two "plates" of the capacitor). Power is not lost by charging these capacitors through these small inductors, but it takes time for each capacitor to charge and pass its energy on to the next coil and capacitor. So instead of the radio power traveling at the speed of light down the coax wire, it's running much slower. (Yes, a straight piece of wire is an inductor.) With plastic insulation, about 1/3 slower than the speed of light. This means that a 1/4 wavelength of coax will only be two-thirds the distance that the two elements should be separated for a free-space equivalence of 1/4 wave.

So, in addition to the electrical 1/4 wave of coax going from element 1 toward element 2, an extra 33% length must be added just to physically reach the second element. As long as the same extra length is added to the feedline going to element 1, the 90 degree phase difference is maintained. Actually, adding 1/6th of a quarter wavelength of coax between the "T" and element 1, and the "T" and element 2, plus the 1/4-wavelength delay section, will make the distance. The phasing would be correct with any additional length, as long as the element 2 (2E) transmission line leg is electrically 1/4 wave longer than the leg to element 1.

The problem then becomes: "What about the match?" If the vertical's base impedance is 52 ohms, and RG-8 or RG-58 coax is used, then two 50-ohm loads would be paralleled at the "T" connection, resulting in a 25 ohm load, or a 2:1 SWR to the transceiver. But the impedance of the verticals should be closer to 37 ohms, and now the impedance seen at the "T" will be complex, a function of both the lengths of coax from the vertical elements to the "T." What the transceiver will see as a load impedance will depend on the impedance at the "T," transformed by the length of coax from the transceiver to the "T." It could be nasty.

The solution is simple: The transformation equation of the quarter wave matching section is the answer. For a quarter wavelength of transmission line, the product of the line impedance (Zo) squared is equal to the product of the two end impedances, or Zo x Zo = Zin x Zout. Zo is the coax surge

Continued on page 36

Triband Vertical Array

continued from page 35

impedance—52 ohms for RG-8, or 73 ohms for RG-59.

According to the 1/4-wave transformation equation, if the input impedance to a quarter wavelength of 52 ohm coax is 37 ohms (such as a 1/4-wave vertical should be), then the impedance at the other side of the coax section would be 73 ohms (matching RG-59 cable). If the match is close, then the length of coax to the transmitter will not affect the impedance match to the transmitter. Most transmitters will have no problem coupling to a 73 ohm load efficiently.

For the phased verticals, using 1/4 wave of 73 ohm coax to element 1 yields an input impedance of: 73 x 73 / 37 = 144 at the "T" connector. Using 1/4 wave of RG-58 to element 2 yields: 52 x 52 / 37 = 73. Now, adding the 1/4-wave section of RG-59 for phasing to the element 2 line does not change the 73 ohms going to the "T" connector. The two parallel loads (144 || 73) work out to a very nice 48.5 ohm match to the RG-8 or RG-58 coax going to the transmitter. The power going to the two elements will not be equal, however, causing a slight loss of forward gain and front-to-back ratio. These are not high-Q circuits we are dealing with here, so neither the lengths nor the match have to be precise for good results.

By using 1/4 wave of 73 ohm coax (RG-59) from element 1 to the "T" and 1/4 wave of 52 ohm coax (RG-58) from element 2 to another 1/4 wave of 73 ohm coax (RG-59) to add the phasing delay, a combined load appears to the transmitter feedline that nicely matches 50 to 52 ohm coax. If you are using a short (loaded) vertical, the vertical's load impedance will be lowered, making the "T'd" impedance higher and actually improving the SWR situation.

For a 40 meter 90°x90° array of two 22.5 foot linear loaded elements, I used a 50-ohm 1/4-wave section to element 1 (50 x 50 / 25 = 100), as well as element 2, for an almost perfect match at the "T" connection. The two 40 meter elements are currently used as a 40 meter rotatable dipole up between my triband quad elements. The input to the dipole measures 25 ohms. Paralleling two quarter wavelengths of RG-59 yields a quarter wave section of 36.5 ohm coax that perfectly matches my dipole to 53 ohm coax.

My HAMVERTS.C program, which runs as a PC DOS executable file, calculates all three flavors of 1/4 wavelengths, once the coax insulation type and element diameter are specified. You can request a free copy of the executable file via E-mail at [hamverts@aol.com], or send a blank floppy and a postage-paid return envelope.

If a frequency value between 1.0 and 148.0 MHz is entered when running HAMVERTS.EXE from PC DOS, the antenna calculations will be made for just that one frequency. Three values

HAMVERTS (WZ8A antenna calcs for 90° x 90° phased vertical array)
At least one, and not more than 8, frequencies should be entered.
Each frequency value must be between 1.0 and 148.0 MHz.
The vertical element average diameter (inches) is used for all frequencies.
As an example: hamverts 28.2 21.15 7.125
Assume PVC (plastic) coax insulator (dielectric) for this example.
Also, assume the average diameter of the vertical element is 1 inch.
Dimension & coax lengths for two 90° x 90° phased verticals — WZ8A calculations —
Assumed velocity factor = 0.66 The 1E & 2E avg. diam. = 1.0 in.
x = z = RG-8/U or RG-58/U, 52-ohm plastic dielectric coax
y = RG-11/U or RG-59/U, 75-ohm plastic dielectric coax
S = Quarter wave spacing between vertical elements
1EyyyyTzzzz> xcvr
s y (z..z = any length of 52-ohm coaxial cable)
s y (T = "tee" connector & "barrel," i.e. M-358 & PL-258/U)
s y (x..x & y..y are electrical 1/4 wavelengths, y = 75-ohm coax)
s y (* = straight jack-to-jack "barrel" connector, PL-258)
2Exxxx*
ˇ
ˇ direction of forward gain

FREQUENCY	1/4 Wave Coax Length	Element Height	Element Spacing
28.200 MHz	x & y = 5 ft. 9.1 in.	E = 8 ft. 5.0 in.	s = 8 ft. 8.7 in.
21.150 MHz	x & y = 7 ft. 8.1 in.	E = 11 ft. 2.7 in.	s = 11 ft. 7.6 in.
7.125 MHz	x & y = 22 ft. 9.5 in.	E = 33 ft. 7.2 in.	s = 34 ft. 6.4 in.

Table 1. HAMVERTS example.

are printed to the screen for each frequency: x represents the length of 1/4 wave of coax; s represents the 1/4-wave spacing between the two vertical elements; and E represents the height of the vertical element, with the element size being accounted for. Up to eight frequencies can be run at one time. If no frequency is entered for calculation, just typing "hamverts" will present the instructions and calculate three frequencies. An example is shown in **Table 1.**

Calculated lengths do not vary greatly between SSB and CW frequencies. So these three example calculations for the 40, 15, and 10 meter Novice bands would be an excellent compromise for General phone and CW operation. Note that the dielectric information can be entered either as a decimal value, or the letters P or F for plastic or foam dielectric.

I wrote this HAMVERTS.C program to determine the optimum spacings for my 10, 15, and 20 meter frequencies of choice, and then reconstructed three triband vertical elements out of the traps and tubing from my TH2MK3 remains. In its latter years of use, the triband two element beam had been reduced to a two-band, two-element, 10 and 15 meter beam with optimum spacing for both bands by tuning the parasitic element as a reflector on 10 meters and a director on 15 meters. It worked up to full expectations, as long as I remembered which way to point it for the band I was on.

For the vertical operation, I only needed to replace the weather seals on the top ends of the traps and run a few spiders out. The 15 meter traps were cleaned up and reassembled to again make each element fit for triband duty. Two of the verticals were set up just outside my basement shack location, and the third element was located as my reference receiving antenna, as far from the two-element array as possible. Actually, that was 120 feet from the closest driven element, or about 1.7 wavelengths on 20 m and 3.35 wavelengths on 10 meters. The reference element was still too close for meaningful front-to-back measurements, but gave general gain readings.

I tried to keep the power levels low and use clear frequencies for testing, as well as sending my call ID regularly. The first time I keyed down for 15 seconds—running 10 watts to one element on the most perfectly clear frequency I could find—back came someone curious about the "A0" signal. It really makes me wonder where all the callers are when I call CQ with my kW running. But no problem—I had a quick QSO with Ken in Houston, explained the testing, and continued on with my antenna project.

The same thing happened when I ran a "testing" message on a 2 meter simplex channel I thought no one ever used. The purpose was to allow a cable service technician to find and fix their leaks (egress). My ingress on the same frequencies was bothering cable channel 18 (same as 2 meters) watchers. After just a few minutes of test transmissions for the cable people on this once-dead simplex frequency, hams came out of the woodwork to find out what was going on. We are a curious lot, are we not?

A minor problem was locating my reference antenna directly inline with my two phased driven elements. An assortment of black walnut trees, sumac (poison and otherwise), and buckeye vegetation obscured the exact location of my reference antenna. So I hung a 27-inch-wide orange Halloween decoration halfway up the reference vertical so that I could spot it when aligning the position of my second driven element. That improvement allowed me to locate my line of direction well beyond any reasonable need.

By the time I returned to the back corner of my lot to retrieve the orange marker, my neighbor at the back corner of the yard had noticed the white backside of the decoration. She quickly came out to ask: "That's not a TV satellite dish your putting up there, is it?" I assured her it was not a TV dish, showed her the Halloween decoration she was taking note of, and returned to my basement shack—leaving the 14-foot vertical with two traps at eye level for her convenient kitchen window viewing.

Continued on page 38

Triband Vertical Array

continued from page 35

My first testing was done with each of my 1/4-wave elements being tested individually with a quick and dirty ground. The vertical ground consisted of a three-foot length of 3/4-inch copper water pipe, left over from our last water leak episode.

The coils that made up the Hy-Gain coils consisted of aluminum wire wrapped around an insulator form, and tap-screwed on each end into the aluminum element tubing. Just like my old aluminum house wiring in Florida days, those pressure connections with aluminum wire have to be tightened every so often to maintain good contact. The same is true for Hy-Gain traps. Also, some crystalline formations between the turns were scrubbed off with rubbing alcohol and an old toothbrush. After the cleanup and tightening, the traps again performed as expected.

After adjusting the element sections for resonance at the low end of 10, 15, and 20 meters, I checked the SWR on all three bands. Almost perfect at the rig, and indeed my MFJ-205 resistance meter measured the resistance right at 50 to 53 ohms. (Remember, I said that is *bad;* a good ground means some mismatch!) So, a trip to the hardware store, $23, a 50-foot roll of welded fence wire, and the SWR now goes to 1.4:1, and the resistance meter now claims I've got a 37-ohm load.

However, the triband business is optional. To keep it simple, make your phased vertical for just one band. Make the driven elements (E) from copper or aluminum tubing, insulate the base of the vertical with a coke bottle, a few inches of PVC, or anything that doesn't become a good conductor when it gets wet. To keep my elements in line, I used three nylon guy cords per vertical. Each cord was fastened to one brick about 8 feet from the base. Bricks make a great guy anchor. The verticals stand straight in strong winds, but the brick will slide when a kid or careless owner runs into the cord or an element at night; everything gives, and no one is hurt. However, there could be a slight esthetics problem using brick guy anchors.

The coax phasing sections are not critical with respect to length. These lengths do not represent tuned circuits with a high Q; listing lengths with the inches broken down into fractions is a bit excessive, but the computer does it for free. It is important to make those calculations based on either foam or PVC insulation. Selecting the mid-Novice band frequencies for 40, 15, and 10 meters will result in spacing suitable for full use of all normal CW and SSB sections of those bands. A slight trim of the driven element lengths might be desired for CW and SSB, but adjusting the coax phasing lengths will meaningfully change the gain and directivity of the antenna.

To measure the coax, I used the basement method (same as garage method):

1. Mark the desired length of the coax phasing section on your cement floor.
2. Solder one PL-259 to one end of the coax section.
3. Stretch the coax out between the marks, with paint cans to hold the coax in place.
4. Wrap tape around the coax to mark the exact length calculated by the "HAMVERTS" program.

The x and y phasing sections going to the antenna require only one connector per cable. For the other end, separate a few inches of coax braid and center conductor down to the edge of the marking tape, and use a 1-inch hose clamp to fasten the coax to the vertical element. The braid can be soldered to the ground rod or ground screen. I like to add a moisture sealant around the braid section to keep water from wicking up the coax braid and possibly reducing the efficiency of the transmission line.

The z..z (any length) and y..y (75 ohm) phasing sections to the phased array need PL-259s on each end. I use the tip ends of the pins on each PL-259 to make my total length measurements, but it is not critical. Do use reducing adapters (UG-175 for RG-58, or UG-176 for RG-59) when using the smaller diameter coaxial cables. That is in addition to the six PL-259s, two barrels (PL-258), and one tee (M-358)

connector required for neatly splicing all the feedlines together. For this project, I followed Bob Simpleton's "guide to PL connectors" and got some superbly clean looking connector results. That follows many years of "figuring it out myself," with sometime unreliable PL-259 connections.

With my triband vertical configuration spaced for 20 meters, I expected an omnidirectional signal on 20, a somewhat omnidirectional signal on 15 meters (less forward gain, and some power off the back), and a simple bidirectional (endfire) pattern with about 2.3 dB of gain in the plane of the verticals and about 20 dB of side attenuation.

Of course, the operating is the proof of any antenna. I could see very noticeable front-to-back and front-to-side gain with the verticals. The two ground-mounted verticals worked stations in the desired direction with ease. I cannot report that the vertical topped my 2-element quad up 40 feet, but then again, with much less hardware and no holes in the house roof (needed to keep the quad up), the verticals come within one to two S-units of the big antenna. In general, the farther away the stations are, the closer the vertical comes to the quad in performance. And with the sunspots increasing, I'm expecting my 90°x90° to do a very nice job on my next Field Day or DXpedition. Give it a try—it's a winner.

Networking

continued from page 32

both the Superposition theorem and Kirchhoff's laws.

There is more than one way to skin a cat. There is also more than one way to calculate the value of resistors in parallel. Before the days of the inexpensive hand-held calculator, the common way to find the value of two resistors in parallel was to use their product over their sum. A calculator that has a single key for reciprocals makes the sum of conductances a much quicker and easier way of finding the effective resistance of resistors in parallel.

The most complex circuits can be simplified and solved with the Superposition and Thevenin's theorems. When a complex network is reduced to a single voltage source with a known internal impedance, cut-and-try isn't necessary.

QRX

continued from page 8

can be reached. To contact Hollingsworth concerning enforcement, E-mail [rholling@fcc.gov] or call (717) 338-2502.

On another front, Hollingsworth has also made good on his well-publicized promise to issue the worst offenders a final warning to clean up their act. Those letters went out on January 8th. What impact the letters and Hollingsworth's on-the-air appearance will have is too early to assess. The one thing it does say is that there's a new FCC in town and the bad boys of ham radio had better beware.

Tnx and a "we'll be good" to *Newsline*, Bill Pasternak WA6ITF, editor.

Enforcer II

The FCC's Riley Hollingsworth K4ZDH is making his list and checking it twice. Now that he knows which hams are naughty, not nice, he's ready to take action against flagrant amateur offenders.

"Fully half of the amateur problems on HF relate to a specific group of jammers by malicious interferers who enjoy disrupting as much amateur communication as possible," said Hollingsworth, the FCC's point man for amateur enforcement within the Compliance and Information Bureau. "Enforcement action against this group is long overdue."

Hollingsworth has prepared a report to his boss, CIB Chief Richard D. Lee, detailing his findings and fingering the most serious violators in a "Top Ten" list which he declined to make public just yet. His memo urged "immediate enforcement action."

Hollingsworth said he's talked with more than 250 people on the amateur enforcement line, (202) 418-1184, since the end of September 1998, when the FCC's latest amateur enforcement initiative kicked into high gear. In addition, he has received more than four dozen letters and E-mailed comments concerning problems in the Amateur Service. Hollingsworth has concluded that, while most amateurs abide by the rules, a few habitual offenders continue to flout the law. "We are not going to stand to be further degraded or destroyed by them," he said.

Hollingsworth says that jamming and deliberate interference is the most common problem, accounting for 31% of all complaints. Repeater misuse and jamming account for another 29%. But he considers the HF abuses, most typically reported on 75 and 20 meters, to be the more serious offenses because they can be national or international in scope. Other general problems accounted for another 17% of the complaints, said Hollingsworth. A full 10% of complaints concerned an unlicensed individual in California who already has spent time in jail for past convictions.

Hollingsworth has sent out 30 informal "warning letters" to individual operators as a result of complaints. The letters warn the recipients that a complaint has been received about the recipient or someone using his or her callsign and indicate that the allegations, if true, could jeopardize the amateur's license and request the recipient to contact the FCC to discuss the matter.

"In almost every case, the recipient has contacted us," he said. "In one case the licensee contacted us, apologized, and reports since that time indicate that the licensee has became a model operator." Some amateurs have reported to the ARRL that amateur behavior has improved, dramatically in some areas, since word hit the street that the FCC was taking amateur enforcement seriously. For its part, the League has said it is willing, for now, not to pursue its request to further privatize amateur enforcement.

Hollingsworth says the warning letters will continue, but now he's taking aim at the hard-core scofflaws within the amateur radio community. "We have now let everyone out there know we're back," he said. Continued violations will "guarantee" license revocations, fines, or in extreme cases, equipment seizures.

"Church is out now," he said. "We mean business and we're strapped in and ready to ride." Hollingsworth added: "Amateur Radio rule-breakers continue these violations at their own risk."

From KD4VBI:

Tough talk for a government official. I hope it isn't a paper tiger. We have heard tough talk before but what happened? Nothing but talk.

For example, my friend AD4PS, Dennis Hamilton, who is a high ranking R.A.C.E.S. officer, a fine ham, and an asset to the amateur community, tried his hand at tough talk toward a horrific non-licensed jammer. What did it land him? He is now under investigation by the very agency he works for.

This maggot of a jammer is well known to the amateur and the county as a culprit who interferes not only with amateur transmissions but also with vital county communications such as fire rescue and the Trauma Hawk medical helicopters—which can mean the difference between life and death.

Yet when AD4PS said this person was jamming a communication (amateur) over the air, this misfit lawbreaker made a complaint to the county against AD4PS that put his butt in a sling.

Now he is not only sweating the stigma of an investigation, but now his job hangs in the balance.

You tell me where the justice begins and the injustice ends in this case. Is it OK to commit a crime but not OK to say who the criminal is?

Does justice mean only just us?

Tnx and an "honest we will" to *The ARRL Letter.*

Continued on page 57

Number 40 on your Feedback card

Above & Beyond

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Frequency extension of test equipment to 24 GHz

This time, let's cover some very useful test equipment to assist you in functioning at 24 GHz. This clever surplus material consists of equipment that can be obtained at lower frequencies for use as actual test equipment at 24 GHz. As most of you know, there is very good test equipment available for 24 GHz, but it is still in the hands of commercial labs. Most of the equipment in amateur hands seems to top off at 18 GHz.

The column this time will describe some surplus material that was assembled to form a testing vehicle at 24 GHz. You are probably in a similar fix in that my test bench does not go above 18 GHz. This seemed to be a hindrance to further exploration of our 24 GHz and above microwave bands. We were out quality testing equipment on these higher microwave bands to see what was happening.

This project to enhance our ability at 24 GHz and possibly even higher is the method we use in the San Diego Microwave Group to adapt our existing lower frequency test equipment to function at 24 GHz. What was needed was a circuit to test both as a spectrum analyzer to look at transmitter signals and a signal source for receiver testing.

The circuit that Kerry N6IZW came up with will function at 24 GHz and allow testing in the transmit spectrum analyzer as well as provide testing on the workbench. While this conversion process is quite accurate as to frequency for both receive and transmit, it does leave some uncertainty in the dBm reference level department.

This converter allows existing low frequency test equipment to be put to use on 24 GHz. Those pieces of test equipment to go beyond 18 GHz do so with the penalty of requiring external mixers that are no longer with the equipment. Coupling this to the increased problem of using the high multiple numbers of harmonics used with these mixers makes correct signal identification difficult.

This problem is universal even on my workbench, which stops functioning at 12 GHz for spectrum analyzers and 18 GHz for sweep signal generators. Sure, the old 8551 HP spectrum analyzer goes up to 40 GHz, but because it uses such high order harmonics and mixing schemes it doesn't provide good data for frequency setting—it's just too vague even with a surplus external mixer. So what can you do to make it function as you would wish and display 24 GHz with good frequency accuracy?

Well, Kerry N6IZW came up with a solution for our microwave group and it works quite well. It does require a few parts to make the unit function. The two major components are a Frequency West brick oscillator at some output frequency in the 11.5 to 12 GHz range, and a very good quality coaxial connectorized microwave-rated mixer. The mixer we used is rated RF-wise to 18 GHz and performs well to 24 GHz. The remaining components include an attenuator to reduce the brick oscillator to +7 dB for local oscillator injection to the mixer, and an SMA-to-24 GHz waveguide transition.

Confused? Let me put you on the right track. We are going to use a low-order harmonic, namely the 2nd harmonic of the 12 GHz brick oscillator as the 1/2 frequency local oscillator injection to the mixer. The second harmonic, along with the fundamental (12 GHz) frequency of the brick LO is injected to the LO port of the mixer. An SMA attenuator is included in this path to reduce the brick oscillator microwave oscillator output to a maximum of +8 dBm. That is the local oscillator injection maximum rating for the mixer we used.

The mixer we selected is one that is rated to 18 GHz for the RF and LO port. It happens to be an SMA coaxial double balanced mixer from Watkins Johnson, part #W-M80. Its specifications are as follows: for the RF and LO port, frequency range 6 to 18 GHz; IF port, DC to 3 GHz. Conversion loss is in the 6 dB range. This mixer, while rated to 18 GHz, still performs at 24 GHz with increased conversion loss at 24 GHz. I don't have the equipment to measure the actual conversion loss at 24 GHz and suspect it is in the 10 dB or so range. Even with excessive conversion loss it works very well.

The goal of this project was to construct a device that would allow accurate measurements to be made at 24 GHz with material on hand. With the exception of the mixer, all other parts were on hand on our workbench. The converter has proven to be quite functional, and has allowed us to put to good use a lower frequency spectrum analyzer for seeing translated frequency and setting our equipment at 24 GHz. It has proven to be quite accurate, even for SSB operation at 24 GHz, by removing frequency ambiguity using a synthesizer-based frequency source. In testing with wideband systems, it performed equally well. Here is how this 24 GHz conversion system functions.

With 1/2 local oscillator injected to the mixer's local oscillator port (LO) (let's say, for simple argument 12 GHz), the second harmonic would be 24 GHz. That's a local oscillator injection of 12 GHz and 24 GHz (second harmonic). The RF port is coupled to a 24 GHz transition to be used as an antenna at 24 GHz. The waveguide also forms a wideband filter rejection of 12 GHz products.

The IF port of the mixer is connected to the spectrum analyzer input. The analyzer acts as a sensitive receiver with a visual display for input RF. It is capable of seeing products of the mixing operation and displaying them on the o-scope of the analyzer. The center line of the analyzer can first be calibrated to frequency by injecting a signal generator set to exactly the frequency expected for reference. Well, with RF at (hopefully) 24.155 GHz, a wideband frequency and the LO's second harmonic at 24 GHz, we mix off the 24 GHz of the 24.155 GHz, leaving a 155 MHz signal output on the IF port.

With the analyzer setup, RF is detected from the 24 GHz (frequency unknown at this time) Gunn transmitter by the waveguide transition and mixed with 24 GHz, producing a signal presentation on the o-scope. Without readjusting the scope on the analyzer, adjust the Gunn cavity frequency adjust screw for center frequency alignment on the spectrum analyzer. When this is done at the previously calibrated 155 MHz marker from the signal generator, you can be assured that the Gunn transmitter is now on 24155 MHz to your calibration accuracy.

While this scenario is true, it is better to use a less troublesome IF frequency depending on what you can come up with. A 12 GHz source sounds nice but is usually not in the cards. Sources with unusual frequencies such as 11.978 GHz will work fine. The exact frequency is not important, as long as it's a near even number to handle. Multiply the local oscillator frequency used by two and subtract the desired frequency on 24 GHz, and that's your IF frequency.

Just keep it in the mixer's IF frequency limit of less than 3 GHz for the mixer I used, the W-M80. Other mixers might have IF frequency ranges with different maximums and minimums. Verify what mixer port operation you have.

Using a higher IF frequency should reduce most unwanted spurious responses to a minimum, making the major signal the correct one on the spectrum analyzer. If you are sure which response is correct, this should not be a problem. If you calibrate the spectrum analyzer screen, you can make, say, 10 MHz per division and see if your system can tune to the other wideband frequency that is 30 MHz lower at 24.125 GHz.

To verify the desired 24 GHz frequency on your spectrum analyzer, adjust your signal generator to the IF frequency and calibrate the center line display of the analyzer to it. Check the signal generator accuracy with your frequency counter. In the scenario described above, we used a 155 MHz IF for 24155 RF. Now, for 30 MHz lower, use 125 MHz or 30 MHz less than our IF frequency to display 24125 MHz center frequency on the spectrum analyzer (with 12 GHz exactly the LO inject frequency to mixer).

With the frequency stability of the brick-type oscillators rated at a few kHz or even tens of kHz, this is of little problem in reference to 24 GHz wideband measurements. With Gunn oscillators, even non-varactor types, voltage tuning can be made over a few MHz at minimum, making an error of 100 kHz nothing to worry about. Do you need a brick at exactly 12 GHz? Certainly not. We only need a frequency out of the brick that is reliable. For example, I found a couple of bricks that came with 111.4768 MHz crystals in

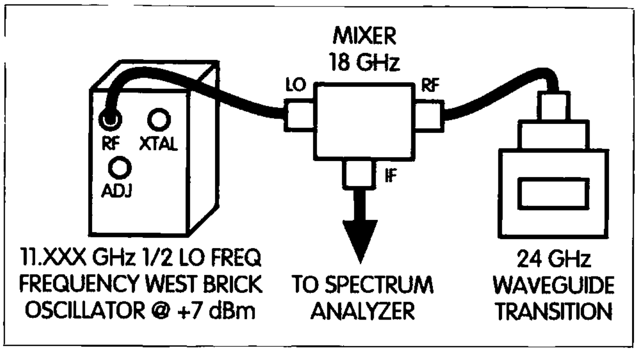

Fig. 1. Block diagram of frequency extension equipment for using low frequency spectrum analyzers to display accurately 24 GHz frequency information using low order harmonic. System uses 1/2 frequency local oscillator and mixer originally made for 18 GHz operation. 24 GHz filtering done by 24 GHz antenna transition using waveguide cutoff for broad filtering.

them. Ten to 12 GHz brick oscillators operate on the 102nd, 108th, or 114th harmonic of the phase-lock crystal—in this case, 111.4768 MHz.

The 102nd harmonic is 11.370 or 22741.267 minus 24155 MHz = 1413.7328 MHz on the IF port. The 108th harmonic lock is 24078.989; I made a slight adjust in the crystal to make it lock at 24079 MHz, verifying the crystal frequency at 111.47685 MHz and making the IF output 76 MHz, for an operation frequency of 24155

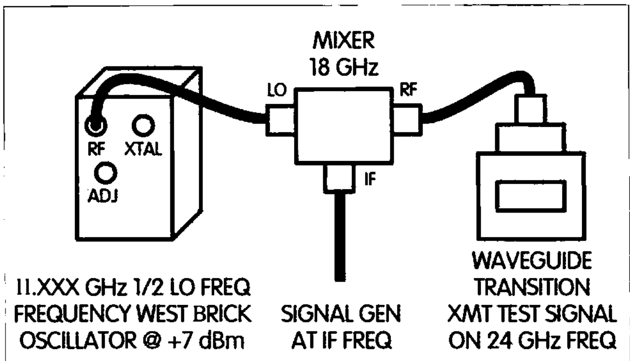

Fig. 2. *Nearly same circuit as in* ***Fig. 1****, but instead of displaying signal being transmitted from 24 GHz unit on spectrum analyzer, change IF port of mixer to signal generator. Now you have modified the original circuit to be a very accurate weak source signal generator on 24 GHz for receiver testing.*

again. There are lots of possibilities—just whip out a calculator and see what you can turn up. It's better to use a higher frequency IF. We found that 1296 MHz or some nearby frequency worked best.

The display on a spectrum analyzer is easy to set as long as you have accurate signal generating equipment and a frequency counter in the 2 GHz range to verify the brick and signal generator frequencies. By mixing down to lower frequencies in this way, we have enabled easy frequency markers to be compared with accurate signal generators and verified with a frequency counter our nearly exact frequency of operation on 24 GHz. Not bad for just a simple bunch of parts bolted together.

24 GHz signal generator

You might have guessed by now what comprises the signal generator setup to verify receiver operation on 24 GHz. Well, it's almost the same connections as for the spectrum analyzer, with one exception. Disconnect the spectrum analyzer and connect the signal generator at the IF port, and now you have turned the brick oscillator mixer into a transmitting converter.

Assume we have just calibrated the Gunn oscillator at 24155 MHz. We are using a 30 MHz IF frequency for the FM receiver, so we need a frequency that will mix with the 24155 MHz transmitter to produce a product 30 MHz lower in frequency. With the signal generator set to maximum output (no more than +7 dBm) and a frequency of 155 – 30 MHz, or 125 MHz, you should hear on your wideband FM receiver a faint but noted signal source. You can use this for peaking up receiver performance and evaluation purposes. For SSB operation, the converter performs excellently.

The signal generator's output is not a fire-breathing dragon but a very detectable accurate signal source for workbench evaluation. It's uncalibrated in actual dBm, but still very useful for determining system operation and some weak signal testing.

When selecting a local oscillator frequency (in the 11 to 12 GHz range), make sure it's high enough to allow a quality signal generator to function along with the source. Also, don't exceed the IF frequency specifications of the mixer port. It doesn't matter what frequency you use—just select one that is easy for you and your existing test equipment. Even some brick oscillators that came with crystals to control the phase-locked brick oscillator frequency could be quite fractional and are just as usable for this purpose. The difference with very fractional numbers is that you will have to use a calculator, unneeded with simple even numbers. A minor arithmetic problem but still very usable. You could in any case possibly make a minor adjustment in the exact crystal frequency to put it on a rounded off frequency for simpler problem solving. My suggestion is to adjust very weird crystals to a frequency more pleasing to your application.

Well, there you have it: both a receive and transmit accurate frequency marker, allowing you to extend the capabilities for your lower frequency test equipment. This technique is quite adaptable even to higher frequencies, although I have not given it a try. We are trying to locate equipment for communications on 47 GHz, the next higher microwave band, but for now this is only a part-time scavenger mission.

A couple of ideas in closing, aimed particularly at the microwave antenna. Most first tries can be made with a modest horn antenna that could be fashioned from hobby copper or brass. The gain of such a small horn antenna is in the 12 to 15 or so dB range. However, when coupled with and using the small horn to illuminate a dish of about 12 inches in diameter, the dish provides some 35 dB of gain to the system. Quite cheap in terms of simple gain. Another thing to take into consideration when using dishes at 24 GHz is that for a dish in the 30- to 36-inch class, the gain goes up into the 44 dB range—quite impressive, but at a cost.

The cost for such high gain with a 3-foot dish is in the beamwidth of the radiated or detected signal. The beamwidth will be less than one degree of compass, making accurate pointing quite important. With such a sharp beam pattern, it might be too rough to find signals.

On the other hand, using a 1-foot dish, the pointing angle is increased to slightly over three degrees, making finding a signal much easier than when using a 4-foot dish. Sure, you only get 35 dB gain with the 1-foot system, but it's not a monster to point. Besides, it can be stored very easily in an apple box, and you don't have the handling problems you would with a much larger dish. These are points you should take into consideration when putting your system together.

Just consider the tripod and supporting structure to make a dish stable with a mild wind. The stress factors with a 4-foot compared to a 1-foot dish are substantial. Considering mountings for a 1-foot dish, use a camera tripod for reasonable use and a heavier tripod for best stability. For the 4-footer you might have to carry around several batteries and concrete blocks to firm up most standard heavy-duty tripods. We suspend batteries or other heavy objects from the center mount of the tripod to provide a rigid mount for the dish and tripod structure.

Well, that's it for this month. Hope you have had as much fun in putting together your microwave system as I have. Best 73 for now, Chuck WB6IGP.

HAMSATS

Amateur Radio Via Satellites

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When Tony England WØORE went to orbit on STS-51 on July 29, 1985, he took the usual SAREX (Shuttle Amateur Radio EXperiment) gear for two-meter voice contacts, but he also included some exciting extras. He had a complete two-way SSTV (Slow-Scan TeleVision) station. SSTV has been around for 30 years. It is a communications mode that sends and receives images using standard audio bandwidth. The signals can be put into a rig via the microphone jack and received through the speaker or headphone connection. SSTV had been used via OSCARs (Orbiting Satellite Carrying Amateur Radio) many years before Tony's trip, but this was the first time for two-way SSTV activity between a space-based ham and those on the ground.

The STS-51 SSTV gear consisted of a SAREX-modified Motorola MX-340 HT, a window-mounted two-meter antenna, Panasonic camera and monitor, Robot 1200C SSTV scan converter, Sony tape recorder and a custom headset. The gear worked well and those with appropriate equipment could receive and view pictures from the shuttle. At the Johnson Space Center in Houston, Texas, a group photo of the astronauts' wives was sent to the shuttle via SSTV. Tony captured the color image and resent it back to earth. The wives had made a round trip to space and back. Those monitoring the two-meter downlink saw this picture along with the many others sent from Tony and the crew.

Only a year after Tony England's ham activity from the space shuttle *Challenger*, the first major component of the Soviet *MIR* space station achieved orbit. Within two years, a full-time, two-meter ham station was onboard. Later, with the addition of a packet terminal node controller (TNC), signals from *MIR*—either voice or digital—were a daily event. *MIR* had an outside antenna and could run more power than the space shuttle. Signals were excellent.

Today on the *MIR* show

A few years ago, a group of hams got together to discuss the possibility of getting SSTV onboard *MIR*. They included Don Miller W9NTP, Farrell Winder W8ZCF, Hank Cantrell W4HTB, Dave Larsen N6CO and Miles Mann WF1F.

In June 1998, Miles Mann arrived in Moscow with three complete SSTV systems for delivery to Energia, the Russian organization that built *MIR*. Six months later, in December, the SSTV system was in orbit and on the air. Miles represents a group called MAREX-NA (Manned Amateur Radio Experiment—North American Division). This organization was created a month earlier as it split off from MIREX (*MIR* International Radio Experiment). According to Miles, MIREX handles QSL cards and some system operator duties, while MAREX-NA builds and flies amateur radio projects for the Russian space station. Information about MAREX-NA can be found on the Internet at [http://marex-na.org/].

The *MIR* gear

The *MIR* SSTV system is very compact and functional. It consists of a stack of electronic devices including a TASCO SSTV system with a color LCD (liquid crystal display) screen, a Kenwood dual-band (two meter and 70 cm) TM-V7A mobile FM transceiver, a custom controller box, an infrared remote control unit and an Apple Computer CCD (charged coupled device) color TV camera. The system is capable of

Continued on page 44

Photo A. Slow-Scan TV from MIR *with Soyuz TM-28 crew. Gennadiy Padalko (flight engineer) and Sergei Avdeyev (flight commander).*

Photo B. A chocolate bear floats in front of the SSTV camera for a shot in December.

Photo C. The MIR-26 mission logo as seen via SSTV from MIR.

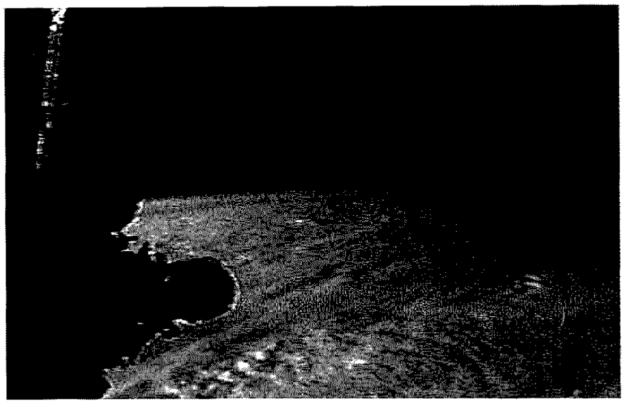

***Photo D.** With the camera aimed out the window, great views of Earth have been sent via SSTV from* MIR.

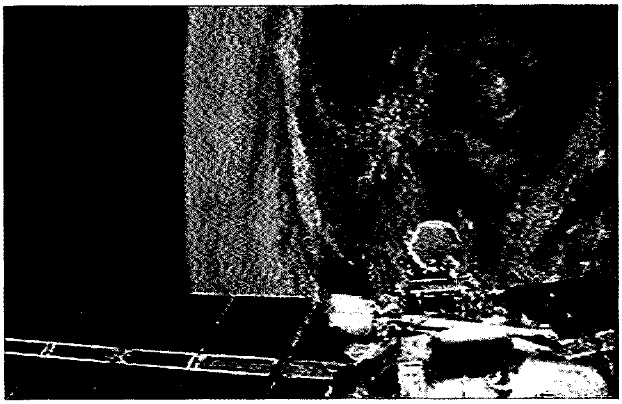

***Photo E.** Solar panels in the foreground and the Earth in the background, as sent from* MIR *in Robot-36 SSTV.*

***Photo F.** A good shot of upper Lake Michigan as seen from* MIR *on a south-to-north daytime pass over North America.*

HAMSATS

continued from page 43

manual or automatic operation and can be used to receive as well as transmit SSTV.

In the automatic transmit mode, the system is set to snap a picture once every two minutes and transmit it with a CW identifier of RØMIR just before the first sync signals. This means that there are about 80 seconds of dead air between pictures. This is the predominant mode of operation and is usually run with the Apple camera aimed out a window, providing spectacular Earth shots during daytime passes. At night you get solid blackness unless the crew has aimed the camera at something inside *MIR*.

The primary operating mode for *MIR* SSTV is "Robot 36." This is the same mode that became highly popular during STS-51 in 1985. It is one of the color formats designed by Robot. The picture transmission takes 36 seconds to form a complete 240-line color image. Image quality is good, but this is not one of the more advanced SSTV formats. *The ARRL Handbook* carries a good description of how SSTV works and definitions of the many modes currently in use.

The Robot 36 mode sends luminance and chrominance information in each horizontal line of the picture. This format is compatible with older black-and-white systems and provides a reasonably easy to receive and decode signal. It has been a popular format for SSTV operation via the hamsats for many years.

Receiving *MIR* SSTV

Due to various RF cabling problems on *MIR*, the SSTV signals have had to share time with the usual packet activity on 145.985 MHz. Originally, the SSTV was supposed to use 437.975 MHz. If time allows for *MIR* cabling changes, SSTV may yet be found on this 70 cm frequency, but for the first few months of operation, two meters was used exclusively. While packet proponents have voiced their complaints, the new crew of SSTV enthusiasts has been delighted with the results. Packet has been on predominantly during the week, with SSTV on the weekends. Doppler shift on 70 cm is three times worse than that on two meters, so pictures are easier to collect on the lower frequency.

A simple omnidirectional vertical antenna (like a ground plane) can be used in conjunction with a standard FM scanner to pick up the SSTV signals from *MIR*. A good two-meter transceiver with a rotatable beam will do better, but many fine pictures have been received and viewed on minimal systems.

It is best not to decode the signal while *MIR* is passing by, but instead to record the strange audio tones during a pass, and then decode them afterwards. During STS-51, it was common to collect images on cassette recorders for later playback. Today you can do a much better job if you have a hi-fi VCR. Connect a good quality video signal into the external video jack. You can get this from a TV with a video output connection or another VCR set up in a similar fashion. Connect the audio from your scanner or two meter radio to the left external audio input on the hi-fi deck. Set the VCR to SP (Standard Play) mode and hit record when *MIR* signals are detected, usually by watching the TV that now has your radio signals coming out of the speakers. Using a low-power HT, you can annotate the process by transmitting on the *MIR* downlink frequency between pictures. You can identify things like the time and calculated latitude and longitude of *MIR* on the tape to help identify the pictures.

Decoding *MIR* SSTV

In 1985, it was an expensive proposition to set up a home station for color SSTV reception. A Robot 1200C scan converter was needed to get good pictures. This could cost over $1000. Some simple software had been developed to decode black-and-white pictures on PCs of that time, but the results were rather dismal. The audio SSTV signal was typically connected to the PC via the cassette input jack. The resultant picture was quite grainy and hard to discern.

Today there are many ways to view SSTV. One is to get a TASCO scan converter like that on *MIR*. Most units cost about $400. Another is to use the

Number 45 on your Feedback card

HOMING IN

Radio Direction Finding

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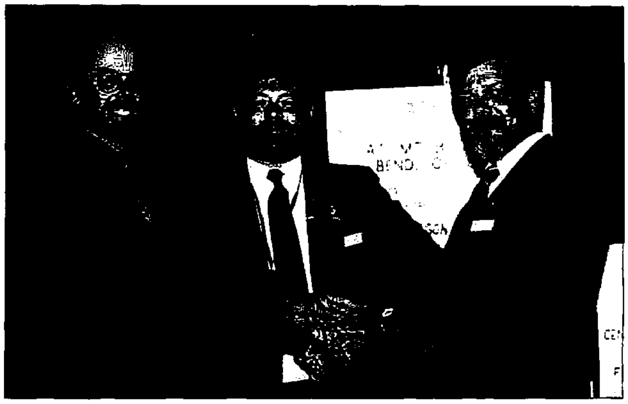

Photo A. Kevin Hunt WA7VTD (center) and Dick Fredrickson WAØDIM (right) congratulate Southern California foxtailer J. Scott Bovitz N6MI at the closing banquet of the first Portland Friendship Games in 1991. Kevin and Dick are still officers of FARS, which is putting on FRG-99 and the Region 2 ARDF Championships.

Dayton, Portland, and South Texas

Is hidden transmitter hunting the fastest growing activity in ham radio? I don't know for sure, but if my correspondence log is any indication, it's getting more popular every month. More and more hams are discovering the fun of on-foot international-style foxtailing (also called radio-orienteering or ARDF) and traditional mobile radio direction finding (RDF) contests (T-hunting or bunny hunting). Whichever type of transmitter hunting you prefer, there's lots of news for you this month.

The 1999 Dayton Hamvention's Fox Forum promises to be the best ever. Here's your chance to meet with RDF enthusiasts from all over the country. This year's organizers are Dick Arnett WB4SUV, Bob Frey WA6EZV, and Jim Elmore KC8FQY. Beginning at 10 a.m. on May 15 (time subject to change), a three-ring circus of foxhunting will feature Joe Leggio WB2HOL discussing his home-brew RDF equipment projects, followed by yours truly's slide show on mobile T-hunting, California-style. Then Dale Hunt WB6BYU will describe the excitement of international-style foxhunts, from last year's World Championships to the upcoming multi-nation event in Oregon.

The fun resumes after lunch, when it will be time for you to chase radio foxes for fun and prizes. Dick, Bob, and Jim aren't saying much about what to expect, except that it will be a challenge to both new and experienced RDFers. Bring your on-foot two-meter RDF gear to use and your mobile T-hunt setups to show off. I'll have my camera.

Crowning champs in the Beaver State

Preparations are in full swing for the upcoming biggest radio-orienteering event in the Western Hemisphere. Never before have hams in so many countries made plans to compete in a foxhunt on US soil. The first International Amateur Radio Union (IARU) Region 2 ARDF Championships will be part of the sixth biennial Friendship Radiosports Games (FRG-99), sponsored by the Friendship Amateur Radio Society (FARS).

I have explained the rules of radio-orienteering many times before, so here are just the basics for new readers: Five "fox" transmitters are placed in a large, woodsy park. They are all

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sound card in your computer in conjunction with appropriate software to capture the images. A good list of available options, both hardware and software, can be found at: [http://www.ultranet.com/~sstv/download.html]. A favorite among *MIR* SSTV chasers has been Windows 95 SSTV (W95SSTV). A shareware version can be found at: [http://www.siliconpixels.com/W95SSTV/W95SSTV.HTM].

Most of the photos here were decoded with this software, using a reasonably current Pentium clone computer and a Sound Blaster-compatible sound card. The program is very easy to use even without reading all of the instructions. Jim Barber N7CXI and Bill Montgomery VE3EC did a really nice job. The software can be used on many SSTV modes and is capable of transmitting in addition to receiving SSTV. If you like the software, be sure to support the authors by registering your copy.

SAREX, SAFEX, MIREX, MAREX

Some confusion has been evident in hamsat circles regarding the state of manned spacecraft ham activities due to the growing numbers of players. SAREX is the Shuttle Amateur Radio Experiment group that was responsible for hams in space starting with W5LFL on STS-9 in 1983. They have been instrumental with activities involving school contacts with astronauts for many years. The group is still very much alive and is working closely with NASA, AMSAT and several related groups around the world to put serious ham radio on the International Space Station (ISS). Their project is appropriately named ARISS or Amateur Radio on the International Space Station.

SAFEX made its space debut as DPØSL in October 1985 on STS-61. DD6CF, DG2KM and PE1LFO operated a dual-band (two meters and 70 cm) system from the German SPACELAB module in the cargo bay of the space shuttle *Challenger*. SAFEX has been responsible for a number of shuttle and *MIR* experiments over the years.

MIREX and MAREX are relative newcomers. MIREX has been responsible for packet system advances on *MIR* and the scheduling of contacts and activities involving the *MIR* crew, school groups and others. MAREX has made great strides with the popular SSTV operation on *MIR*. Whether all the groups will be able to work together to advance ham efforts on manned spacecraft is unknown. In the meantime, we do know that what we now have in orbit is a limited resource. The crew on *MIR* was changed in late February. *MIR* is scheduled to be vacated in July if no funding is available to keep the orbiting outpost running. The Russian space station would then be brought back to Earth, rather violently, in August. Collect pictures while you can!

on the same frequency, transmitting in turn for 60 seconds each. One after another in rotating sequence, they send a simple Morse message. You don't have to read the code to figure out which fox is on the air, because you can simply count the number of dits in the repeated message.

Your mission is to go to each fox, punch your orienteering card with the unique punch you'll find there, and then get to the finish line first. If you take too long (the limit is about two hours), you not only don't win, but you are disqualified. The shortest route varies greatly, depending on the size of the venue. For the Region 2 Championships, it will be between 2.5 and 4.5 miles.

Besides the age 18-to-40 (Seniors) division for men, there are special age divisions at most formal ARDF events for Old-Timers (men ages 40 to 55) and Veterans (men ages 55 and up, regardless of military service). Of course, Juniors (males under age 18) have their own division, too. IARU leaders are discussing a proposal to have four corresponding age divisions for women, but right now there is only one division for all females. In regional and world championship foxhunts, the Juniors, Old-Timers, Veterans and Women need to find only 4 of the 5 fox transmitters.

If you are selected for Team USA 1999, you will vie for medals against foxtailers from Canada, eastern Russia, and Japan, Other countries that are likely to send teams include Bulgaria, France, Norway, Sweden, western Russia, Moldova and the Ukraine. The most formidable competitors are likely to be on the team from Moscow, which placed either first or second in every age/gender division in the two-meter event at the last ARDF World Championships.

The Ukrainians also had a very strong team at the 1998 championships, taking gold in the Women's Division and bronze in every other division. Scandinavian ARDFers are very good, too—especially the older ones. Norway took fourth place and Sweden took fifth place in the Veterans Division last year.

Although there has never been an IARU ARDF championship event in North or South America before 1999, FARS has had lots of experience. It started in 1989, when a small delegation of Portlanders traveled to Khabarovsk, Russia, a sister city to Portland, for a week of home stays, touring, and radiosport competitions. They were joined by hams from Niigata, Japan, another sister city. There were contests in on-air DXing and CW sending/receiving, and a two-meter foxhunt. None of the Portlanders had ever tried RDF in the woods before, but they enjoyed it.

When it was their turn to host the Russians and Japanese two years later, FARS-Portland connected with southern California T-hunters and put on a great foxhunt. A sister city delegation from Victoria, British Columbia, joined FARS and hosted the Games in 1993. They cleverly enlisted help from the Vic-Orienteers, a local orienteering group, to make their foxhunt a premier event. Russians and Japanese hosted the Friendship Games in 1995 and 1997, respectively, with the foxhunt again a major event each time.

The Games return to Portland this year. Many of the original organizers will be in charge, including Kevin Hunt WA7VTD, general counsel of FARS-USA and secretary of FARS International (**Photo A**). Others are relative newcomers, such as Foxhunt Committee Chairman Dale Hunt WB6BYU of Yamhill, Oregon.

Dale, who is not related to Kevin, is no stranger to ARDF. He competed at FRG-97 in Japan, where he finished first among all entrants from North America. Then he led the USA's delegation to the ARDF World Championships in Hungary last September (see "Homing In" for January 1999). He continues to serve on the international committee that is reviewing and revising IARU's championship foxtailing rules and procedures.

For kids of all ages

When we think of radiosports, an image of teenagers and young adults comes to mind. But that's no excuse for the rest of us to shy away. You don't have to be an athlete or a marathoner. "Homing In" has told tales of gold medalist ARDFers bagging five foxes in 45 minutes on an 8-kilometer course (about a 9-minute-per-mile pace). But that's the exception, not the rule. The median times (half faster, half slower) for the two-meter hunt at the last World Championships ranged from 75 minutes for Old-Timers to 95 minutes for Veterans.

That's right, the middle-aged men did better than youngsters at finding their required 4 foxes! And 19 minutes per mile sounds much easier, doesn't it? It's often possible to briskly walk the course and still finish in plenty of time, if you are efficient at RDF. You can do that, can't you?

The two-meter hunt in Oregon on August 11 will probably attract the most interest from North American foxtailers, but don't miss the opportunity to try 80 meters the next day. Radio-orienteering on that band is a bit different, but just as much fun. In some countries, such as Sweden, almost all foxhunts are on 80. The Swedes run through thick forests during rain, snow, or sun, carrying cigarette-pack-sized receivers with ferrite rod antennas that don't snag the thick vegetation like a two-meter beam or quad does.

Small air-core loops are popular in other countries, such as Russia. In either case, better accuracy is obtained by utilizing the antenna pattern's sharp null instead of its broad peak. A little "sense" wire creates a cardioid (heart-shaped) pickup pattern to eliminate the ambiguity of a bare loop antenna, which has two nulls 180 degrees apart (a figure-8). Equipment for this band is easy to build. You may even be able to modify an AM transistor radio to work there. Experimenters, here's your chance to innovate!

Whether you are an expert foxhunter, a weekend jogger, an orienteering fan, or just want to see foxtailers in action, plan to be in Portland during the second week of August. Want to know more about the rules and suitable equipment? See the "Homing In" Web site or check your *73* back-issue library for my columns in the January 1998, June 1998, and January 1999 issues. You can read all about what it's like to attend previous Friendship Radiosport Games in the September 1991, October 1993, and January 1996 issues.

There will be more about preparation for the championships in upcoming "Homing In" installments. But don't put off registering. FARS needs to know how many hams are coming, and I need to plan the makeup of Team USA. If lots of stateside hams sign up, we may need to hold a qualifying event or find another way to allocate the limited number of available slots. There's an application form for Team USA at the "Homing In" Web site. Download it, fill it out, and send it in to me via E-mail. Make paper copies of the form to hand out at your local foxhunts. Completed paper copies can be mailed to my postal box listed above. If you're not on the Internet, send a self-addressed stamped envelope to me and I'll send back a form for you to fill out and mail.

To compete for a country other than the USA, contact your country's ARDF Coordinator or national society headquarters. ARDF Coordinator for the Canadian national society (Radio Amateurs of Canada) is Perry Creighton VE7WWP. His E-mail address is [ve7wwp@rac.ca].

Don't leave out your family. Most ARDF Team USA members will be amateur radio operators, of course, but a ham

ticket is not required for participation in this event. Let others in your family try out your ARDF equipment as you practice. Maybe they will decide to join in the fun. Tell your local orienteering club about it, too.

It's not too early to start making your travel plans. If you're arriving by air, WB6BYU reminds you: "Book to Portland, Oregon (PDX). The other Portland is almost 2500 miles away!" Save airfare dollars by planning a Saturday night stay, arriving on August 6 or 7. There will be practice and training events on August 9 and 10, followed by competitions on the next two days. The closing banquet will be August 13.

As the weather warms up, it will be time to hold radio-orienteering practice sessions in your home town. How about packing a picnic or grabbing some takeout food and heading to a local park for a couple hours of foxhunting on Sunday afternoons? That's what members of the Super System 440 MHz repeater group have been doing lately (**Photo B**). Let everyone take a turn at planting the transmitters and trying out the RDF gear. As strong competitors emerge, encourage them to do additional training for participation at the Portland championships.

Where'd the owls go?

Thanks to the many readers who responded to my plea for volunteer monitors to assist the Burrowing Owl Project. (See "Homing In" for August 1998.) There is no way of knowing exactly how many hams and scanner enthusiasts listened in the 172 MHz range for the collar transmitters during the southward migration and wintering period of the 41 banded Saskatchewan and Alberta owls. Unfortunately, the birds have been elusive to both hams and the Canadian biologists.

One of the volunteer hams, Grier Garrick KC5FJZ of Rockport, Texas, was first to report a pulsed signal on 172.370 MHz on 22 November. A radio collar on that frequency had been attached to a juvenile burrowing owl at a farm about 5 miles east of Moose Jaw, Saskatchewan last summer. The Rockport signal disappeared before it could be verified and tracked down. "Cactus Charlie" Hoffman K5SBU has driven hundreds of miles through the counties south and west of Corpus Christi, finding four unbanded burrowing owls and occasionally picking up radio collar signals. So far, however, he has not sighted a banded owl from Canada.

In early December, Jason Duxbury, a graduate student researcher, copied an owl tag from an aircraft west of Kingsville, Texas. He also picked up a signal from the air over Tamaulipas, Mexico, but neither owl could be located on the ground. New burrowing owl habitats were discovered by the Saskatchewan researchers in Texas and Mexico during an expedition in February, but none of these owls had Canadian radio tags or leg bands. It is unknown if the newly documented Texas and Mexico owls are permanent residents or if they migrate in and out of these places. Much more research is needed on this threatened species, which is listed as endangered in Canada. Additional studies will be done as funding permits.

Most of the tags for the 1998–99 Saskatchewan study have exceeded their anticipated battery life. There are still eleven owls out there with 8-month-duration tags installed last August and September. They may still be on the air when you get this issue. Frequencies are listed at the "Homing In" Web site, or you can get the list by sending a self-addressed stamped envelope to me. The expected northward migration period is late March through early May, so if you live in the predicted path (from Texas through North Dakota), please monitor regularly, especially at night. You'll find suggestions for radios, antennas, and monitoring techniques at the Web site.

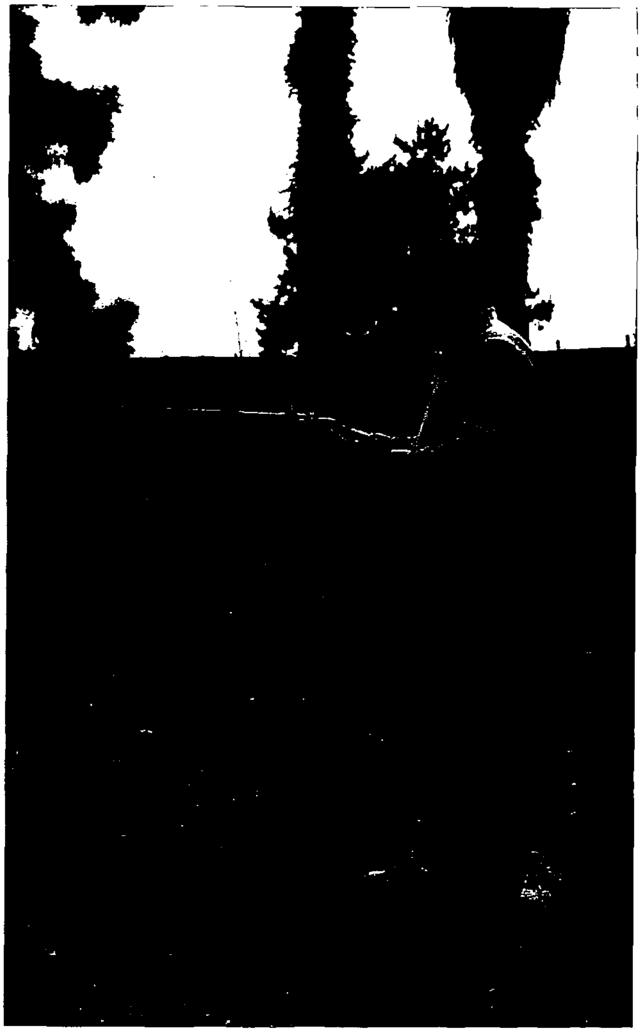


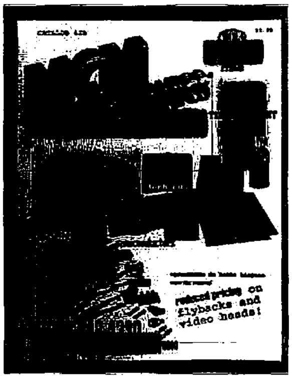
Photo B. Dave Reeves AC6PP pauses to get a bearing during a 440 MHz all-on-foot foxhunt in a Fullerton park. All that he needs to get good bearings with his handie-talkie is a lightweight yagi with an attenuator mounted on the boom.

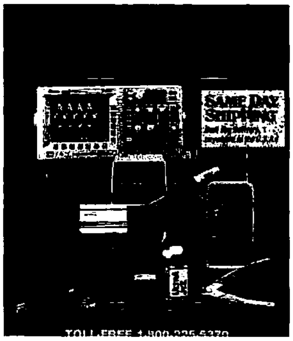
Many hams outside the migration range of the Saskatchewan owls have written to me, asking how they can participate in similar research projects. I am working on several possibilities right now. For instance, a study of brown pelicans by a California university is being planned for the west coast of the USA and Mexico later this year. If funding can be found, researchers will tag additional birds to be tracked by volunteer monitors. The tags will be in the 148 MHz range, making it much easier for hams to use existing two-meter base and portable antennas than it has been with the Burrowing Owl Project.

In addition, the renowned Cornell University Laboratory of Ornithology is considering volunteer monitoring for an upcoming West Coast project. If you would like to participate in these studies or others, please send postal or E-mail to me right away, giving your location and receiving capabilities. You don't need portable RDF gear, but it would help. 73

Number 48 on your Feedback card

New Products





Free Cats

MCM Electronics catalogs always look terrific, don't they? And they're chock full (more than 40,000 in-stock items) of cool stuff and toys, too.

For your free copy of the latest catalog, write to MCM Electronics at 650 Congress Park Drive, Centerville OH 45459-4072; call (800) 543-4330; or visit their Web site at [www.mcmelectronics.com].

Jensen Tools has released a new catalog, too. This 108-page, full-color offering contains a wide range of tool kits, specialty tools, diagnostics, and service aids for everyone involved in any form of electronics.

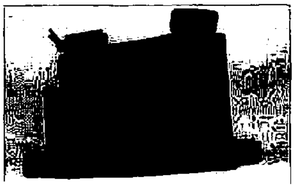
Contact Jensen Tools, Inc., 7815 S. 46th St., Phoenix AZ 85044; (800)-426-1194; E-mail [jensen@stanleyworks.com]; site at [www.jensentools.com].

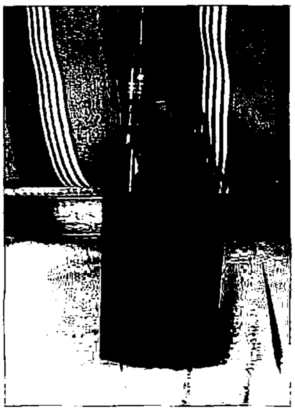
And speaking of contact, Contact East's new 1999 catalog features 308 pages of new tools and test instruments for engineers, technicians, and hobbyists.

Contact East, Inc., 335 Willow St., North Andover MA 01845; (978) 682-2000; [www.contacteast.com].

PROsat for Windows "i"

This hot new APT/WEFAX weather satellite reception interface and software contains just about every feature possible. The interface hooks up to your computer's serial port (can be used with a notebook or a desktop) and can take up to three different receivers. This "i"-version software upgrade now includes multispectral color NOAA APT images; cubic interpolation for smoother display at higher zoom levels; zoom in and out while receiving; quick "auto limits" contrast setting; multiple windows for the same image (e.g., to view NOAA IR/visible simultaneously); continuous polar autosave with autoschedule, to receive all passes with no user intervention; and color animation. Timestep, PO Box 2001, Newmarket CB8 8XB, UK; tel. (+44) (0) 1440-820040; E-mail [sales@Time-step.com]; site at [www.Time-step.com].



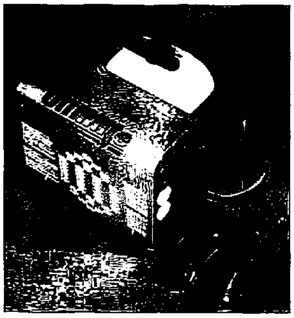


For Ham SWAT Teams

MFJ has come up with a couple of great accessories for emergency operators and on-the-go hams. Their new HamGear™ Tactical Chest Harness is perfect for portable use, DXpeditions, Field Day, biking, and hiking, not to mention search and rescue and other types of missions where hands-free operation can be a plus. MFJ's HamGear™ Belt Radio Holder protects your radio from harm, theft, and misplacement, while holding it vertically (as does the harness) to improve reception. Both of these handy items are made of rugged materials for long life under tough conditions. MFJ Enterprises, Inc., PO Box 494, Mississippi State MS 39762; (601) 323-5869; FAX (601) 323-6551.

MFJ Duckies

MFJ's new Model 1817 is a dual-band 144/440 MHz HT antenna that successfully blends the telescopic and flexible features found in several different antennas into a single antenna incorporating both popular traits. When retracted, it's 9 inches high and acts like a rubber duck. When extended to 14-1/2 inches, you get a super range extender at maximum radiated power that is hard to beat. Little brother Model 1816 doesn't have the extra gain; it's 6 inches when down and 8-1/2 inches up. Both of these HT duck antennas are extremely rugged, super flexible, and built to last. MFJ Enterprises, Inc., PO Box 494, Mississippi State MS 39762; (601) 323-5869; FAX (601) 323-6551.



ULTIMITE Generator

The Coleman Company—you know, the cooler people—has brought out a new generator that might be worth a look. Called the ULTIMITE, it puts out 120 volts at a consistent 60 Hz regardless of the engine's rpm, thanks to an advanced technology microprocessor. At 1,100 watts AC or 90 amps DC it packs a lot of power, yet it weighs just 23 pounds. DC current output can be 12 or 24 volts—enough to easily jump-start that dead truck after Field Day. One tankful of gas (1.2 quarts) will last for as long as 1-1/2 hours at 50% load. MSRP is $495; contact Coleman's Advanced Products Group, 2983 Sterling Ct., Boulder CO 80301; (800) 445-1805; [www.ultimite.com].

Number 50 on your Feedback card

The Digital Port

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I have been curious for some time about a concept that sounded very good. A great effort was put into a program, RITTY, by K6STI. The novel concept, one with which I see other programmers experimenting, is using the sound card in your computer as the main hardware for modulating and demodulating the RTTY signals.

I have discussed before the ChromaPix SSTV software that also uses the sound card, and had wondered why sound card programs for other digital modes weren't surfacing. The real reason is that it is a lot of work and, as you will see, sometimes not very rewarding.

A bad apple can ruin it for the rest of us

Apparently, I waited too long to give this a try. There is some interesting information on the N1RCT Web site concerning this adventure. It seems that the RITTY program was into its second version and working quite well, but there developed a snag. An unscrupulous hacker got hold of a copy and made a counterfeit version that he was distributing at a reduced price.

The originator of the program has now withdrawn it from the market and has a very sour taste in his mouth from those who would thwart his honest efforts. I guess that is one of the pitfalls of this high tech stuff. It seems the hacker even bragged to K6STI how he had broken through the code.

Lots of good info

The N1RCT Web page is filled with a lot of information about other RTTY projects, with links for more information and downloads as well as programs that do CW, PACTOR, WEFAX and some SSTV thrown in. Very comprehensive, at [http://oxford.megalink.net/~n1rct/index.html].

I happened onto the site as I ran a search for RITTY. It was interesting just for that purpose, and then I realized I wasn't even on the index page. So the above address is the home page from which you will find a wealth of links to much info. You will find some links that are already listed in **Table 1,** and many more of which I was not aware, so a little exploring may turn up something you have been waiting for. There is nothing that says that I have found all the best ham stuff and there is nothing left out there to unearth. Let me know if you find something useful before I get back there to check further.

Bogus E-mail ad?

When I was viewing my E-mail the other day, I found a commercial piece in there that looked fairly legitimate telling me how time was running out to purchase one of the few remaining copies of *The Communicator's Handbook*. It guaranteed that I or someone had entered my name into their database and that I should therefore be interested.

The soon-to-be-unavailable book promised to reveal all there is to know about radio and even give a look at future forms of radio communication that haven't been invented yet. It was only $20 and, again, I had better hurry.

Current Web Addresses

Source for:	Web address (URL)
HF serial modem plans + software	http://www.accessone.com/~tmayhan/index.htm
PCFlexnet communications free programs	http://d10td.afthd.th-darmstadt.de/~flexnet/index.html
Tom Sailer's info on PCFlexnet	http://www.ife.ee.ethz.ch/~sailer/pcf/
SV2AGW free Win95 programs	http://www.forthnet.gr/sv2agw/
BayCom – German site	http://www.baycom.de/
Pasokon SSTV programs & hardware	http://www.ultranet.com/~sstv/lite.html
Winpack shareware for Windows	http://www.duckles.demon.co.uk/ham/wp.htm
Baycom 1.5 and Manual.zip in English	http://www.cs.wvu.edu/~acm/gopher/Software/baycom/
Source for BayPac BP-2M	http://www.tigertronics.com/
Tucson Amateur Packet Radio—where packet started—new modes on the way	http://www.tapr.org
TNC to radio wiring help	http://prairie.lakes.com/~medcalf/ztx/wire/
ChromaPIX & W95SSTV	http://www.siliconpixels.com/
Timewave DSP & former AEA prod	http://www.timewave.com
International Visual Communication Association—a non-profit organization dedicated to SSTV	http://www.mindspring.com/~sstv/
Small computer boards, various kits	http://www.ldgelectronics.com

Table 1. Current Web addresses. If you encounter a problem with a European address, the network is sometimes at fault. Try again later.

I assumed one of you readers must have put me on the list to upgrade my radio IQ. I knew I would be an embarrassment to the ham community if I didn't at least check it out, so I did. I dialed up the [amazon.com] Web site and got the info sheet on the "book of all knowledge" hitherto and in the future never to be outdone.

It is probably a decent book for the serious SWLer who is just getting started. It promises a list of foreign broadcast stations and their schedules and a lot of other information that the general listening public is not aware of. Also of interest, the price from [amazon.com] was about half of what the E-mail promoter was going to let me have it for if I got in right away. Plus, the information is a little dated. The book was published at the beginning of 1997.

So, if you have gotten such an offer, those are the things I found. I doubt if anyone really volunteered my name. The E-mail guru probably has a CD of ham addresses. Not hard to come by—just send money.

Also in my mailbag: I got a request for info on how to wire the Kenwood VC-H1 to the ICOM 735. Right up my alley ... kinda. This was just before writing this article, and I had to pose a few questions to the writer concerning whether a plug is available for the Kenwood end and if he could identify the Kenwood pinout.

That is another piece of equipment I have not had an opportunity to hold in my hands. It is a novel setup, in that it is a digital camera that will interface to a Kenwood handheld and, I think, a serial port on your computer. There is quite an advantage to any digital camera for SSTV because you can bypass the developing of roll film, plus, with the VC-H1 at least, you can immediately send the digitized image file directly out over the airwaves.

I am still at the developing and scanning stages. This may change, as I was informed by the info seeker that the prices have dropped somewhat. The original asking price was around $500. Not an outrageous sum of money, but I don't know how versatile the unit is. There are some pretty good units out there for about that price range that lack the direct interface to a radio, of course.

Retrospect

Time is catching up with you when the months seem shorter at a rapidly decreasing pace. It seems not too long ago that Christmas took forever to come from year to year.

This column isn't about aging, or even aging gracefully (I let Wayne expound on those things ... He is one of the few who have been making footprints in the sand longer than I.), but sometimes I get a fix on something that I have to tell you about.

And there is a problem when I get off the track a little as I did with the story of my mobile antenna a short while ago. I received one vocal (via E-mail) reprimand from Marv W5MTV that gave me reason to evaluate the purpose of this column and why I write it.

The purpose is to relay my excitement about the digital modes of ham radio to such an extent that you will want to give one or more of them a try. I haven't tried everything, but those of you who have stuck with me have seen quite a few modes and pieces of software that I have discovered.

I know this because many write and ask for more information or just simply to give a word of thanks and encouragement. That makes it well worth my while (even when the whiles seem to get closer together.)

I answered Marv and apologized for spending so much time with the antenna project. I explained that I had gotten enthusiastic about the project and wished to share the news. Just simply got carried away.

A real learning experience

I am still working on this project. I don't know if I reinvented the wheel, but I learned some things that were never evident within the confines of the stationary shack. My first attempt to run the laptop with the HF radio turned into a small disaster. It was a different set of circumstances than using VHF for packet in the same vehicle.

Some of you probably recall that I am using the Radio Shack® voltage inverter to power the laptop. I found out that that device emits a small signal which got right into the ICOM 735. I found too that some of the interference went away when I disconnected the serial cable, but was still prevalent at regular frequency intervals about everywhere I listened until I turned the inverter off.

As if that wasn't enough problem, I began to notice a new phenomenon as I was driving along attempting SSB. When I would push the PTT, the radio would send a signal of 25 to 75 watts without me uttering a peep into the mike. That wouldn't have been so bad, but during closer observation, I found this didn't happen with the vehicle at standstill with the engine still running!

It was just about hair-pulling time. Something in the vehicle was generating RF, but apparently only when the wheels rotated. Then it changed. After another few hundred miles (I was on a 500-mile trip), the RF was being picked up when we were at a standstill as well as when we were rolling. I never made a contact to see if the signal was readable. It was one of those times when I thought briefly about asking a local ham to monitor, then invested a little time in logic. The problems needed a cure regardless of what the resulting signal distortion was or, perhaps, was not.

As my mind wandered down various avenues, I thought of the few things that might possibly

Number 52 on your Feedback card

QRP

Low Power Operation

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Well, just when you thought it was safe to unlock your doors, I'm back! Just a short vacation from the column to get caught up on other projects. With the Y2K bug getting ready to bite in less than eight months, I've been very busy installing utility grid backup systems all over the place. Some of these systems can really make a QRPer drool! Can you imagine having over 33 kW hours of battery storage sitting in your garage waiting for the big one to hit?! Can you just begin to imagine how long you could operate an Argonaut 509 from that battery bank?!

In case you don't know what a grid backup system is, let me take a few minutes to give you a quick overview.

Although it is technically possible to operate everything you may have in your house during a power outage, lack of money usually dictates what will operate. Oh, yes: If your home is all-electric, forget about the electric stove, electric water heater and electric clothes dryer. It can be done, but the expense outweighs common sense.

So, you select what loads you want to operate on the backup system. This may be your computer room, ham shack, family room and so on. You can usually load up to 60 amps of AC loads. You then pull these out of the main circuit breaker and install a subpanel.

A DC-to-AC inverter is installed in the house. I use the Trace SW series inverters. These guys produce up to 5.5 kW and you can gang two inverters together for a total of 11 kW worth of backup power. The output of the SW series is pure sine wave. Not the modified sine wave you see in some inverters. The output is so clean, you can sell the power generated by the inverter *back* to the utility. That's a lot of bang, and it takes a lot of batteries to do the job.

In most systems we do, I use the Trojan L16 deep-cycle battery. At over 350 amp-hours each, these guys are big and heavy.

So, how does the system work? Well it's all automatic and completely transparent to the user. When you have grid power, the inverter sits there charging up the batteries. The charger will float the system all

---

generate a signal in the RV conversion. There is an igniter in the propane refrigerator. Turning that off made no difference. About the only other possibilities of generating RF were the ignition system, wheel bearings (or more likely brakes) or the cruise control. These ideas came along before the problem showed itself with the vehicle parked.

Logic ... The radio had performed very well under test conditions when transmission line and 12 volt supply were strewn across the floor in a haphazard array. Once neatness took over, the problems began. Simply, to make this as short as possible, I had coiled the excess 12 volt feed, taped it neatly and stood it vertically behind the driver's seat. It had become an antenna.

After other items in the same storage space had been removed and replaced several times, the loop went horizontal and the character of the problem changed. More logic ... I didn't care what the source of the mysterious RF was or is. It was only necessary to eliminate its effect.

The cure was to wrap several turns of the RF feed through a toroid, making an RF choke—and what a difference. The PTT transmit problem disappeared as well as the interference from the Radio Shack inverter.

I pass these items along because they may be of value if you should experience such problems with a mobile installation—especially readers of this column, who would include a computer. I haven't placed the radio in its permanent location yet. Perhaps when the 12 volt line is cut to length and the loop is removed it will not be such an effective antenna. Nevertheless, it will be some kind of antenna that may still need to be dealt with and so far the toroid works for me.

I mentioned previously that I was getting one of the automatic antenna tuners from LDG Electronics. I did. It is a beautiful piece of equipment. If I weren't so bent on assembling things myself, I would be using it by now. For an extra $40 they will assemble it and that is well worth the price. So, as time constraints go, it will be a while yet.

Final demise of the packet modem kit

One point of interest here is that Dwaine at LDG confirms the fact that there are no more chips to make the packet modem kit he was selling. About a year ago he had a little over 100 of those kits left. He said that they suddenly disappeared when he made notice on his Web site that they were the last of the breed. I would like to flatter myself into thinking that you readers led the rush to buy those after I wrote the article on the modem at about that time. However, I know of only one reader who actually purchased a modem kit, so it was more likely Dwaine's clever "they're going fast" marketing approach. Anyway, all good things come to an end.

There are new things out there

It would be nice if I could get my hands on everything that is used in the digital modes. Some are only available by outright purchase. I have some of those, along with numerous freebies or trial-before-purchase items.

I am going to have to speak to some of the providers who would like a little exposure in this column. To be honest, I have never had my hands on any of the pieces of standard fare from Kantronics™. Not their fault—I just need to be more aggressive.

My ideas of standard fare currently revolve around the AEA PK-232MBX, which is getting pretty ancient; the packet TNC-2 clone from MFJ; their model 1274; the Timewave DSP-599zx with its custom DSP-RTTY software package; and the numerous software programs I have discussed in this column such as XPWare, which works exceptionally well with my PK-232MBX; HamComm, which is shareware that does a pretty fair job with my laptop; ChromaPix, which uses the SB16 sound card in my desktop for SSTV; and Pasokon, which performs wonders in my laptop with a homebrew serial modem for SSTV—to name a few. And I must not neglect to mention the BayCom-style packet modems and various software packages. You can find more info on most of this at the Web sites in **Table 1**.

If you have questions or comments about this column, please E-mail me at [jheller@sierra.net] and/or CompuServe [72130,1352].

I will gladly share what I know or find a resource for you. For now, 73, Jack KB7NO.

the time, or you can tell it only to charge the battery bank at a certain time of the day. This is used mainly to reduce the cost of operating the charger.

All the AC loads, including the ones in the subpanel, are being powered by the grid. The inverter is sitting there running in parallel with the grid. Its output is in sync with the grid, matching it with the proper phase and voltage. If the grid goes down, the inverter that is running along with the grid tries to operate the entire electrical grid. It can't, so in about 30 milliseconds the inverter drops out and comes back up. With the inverter now up, it powers only the loads that have been selected in the subpanel.

The run time of the inverter depends on many factors. The biggest one is the size of the loads you'll be running. The second factor is the capacity of the battery bank you're using. Since a normal inverter is rated at 4 kW, if you would load the inverter down to its maximum capacity with a 750 amp-hour battery, the battery would be dead in about five hours. Lighter loads, and the battery bank will run longer. In most cases, you can plan on getting from one to four days of inverter power.

When the grid comes back on, the inverter once again becomes a charger and the battery bank is quickly recharged. The system then waits until the next outage.

Got a generator? No problem! The inverter has the smarts to ask the generator to start up (assuming the generator has an electric starter!) and recharge the batteries if they get too low.

So that's what a grid backup Y2K system is. Of course, you don't need to wait until the year 2000 for a system like this. A good old-fashioned thunderstorm can knock out your power just as quickly as any computer bug.

Oh, yeah—the bottom line. Most systems run about $4000 to $9000, depending on the type of inverter, battery and options such as solar panels.

That's what I've been up to, and later on in the year, as we get closer to December 31, 1999, I'll really get busy! But, let's relax and get ready for the Dayton Hamvention. Once again, the QRP ARCI will be hosting FDIM at the Days Inn. Here's the poop, from the chairperson himself:

QRP Amateur Radio Club, International (QRP-ARCI), proudly announces the fourth annual "Four Days In May" QRP Conference commencing Thursday, May 13, 1999—the first of four festive days of 1999 Dayton Hamvention activities. Mark your calendar for this extra bonus day and register early for this not-to-be-missed QRP event of 1999.

Amateur Radio QRP presentations, workshops and demonstrations will be the focus of the full day Thursday QRP Symposium to be held at QRP ARCI headquarters—the Days Inn Dayton South. Last year, this sold-out event had a "standing room only" crowd of 175 enthusiastic attendees. FDIM QRP Symposium attendees will start their day with a wake-up coffee social and then plunge into a full day of multimedia QRP presentations by renowned QRP authors and designers.

Papers to be presented include:

- *Vertical Antenna Design & Analysis,* by L.B. Cebik W4RNL
- *Constructing QRP Equipment,* by Rev. George Dobbs G3RJV
- *Design of a DSP-based Coherent CW Xcvr,* by George Heron N2APB
- *QRP Construction Tools & Tricks,* by Dick Pascoe GØBPS
- *Mixer Madness,* by Clark Fishman WA2UNN
- *PIC-based Rainbow SWR Bridge/Tuner,* by Joe Everhart N2CX
- *When Signals Go Wrong—Distortion Demystified,* by Dave Benson NN1G

Culminating this first day will be an evening QRP ARCI Author Social for folks to meet the QRP presenters. All are invited.

The QRP ARCI "Four Days In May" 99 QRP Symposium will be the talk of the Dayton Hamvention.

The "Four Days In May" QRP extravaganza continues with the annual Friday night QRP ARCI Awards Banquet honoring QRP dignitaries for their service to the amateur radio community. A special evening has been set aside after the banquet for the FDIM QRP Vendor Social, where prizes will be drawn. All are invited.

FDIM Saturday will be special this year, with an evening social for QRPers to meet the many regional North American and International QRP Club members—bring your banners! The evening culminates with a *building contest* ... the categories are wide open, so bring your latest kit, home-brew project, antennas, whatever! Judges will select winners for prizes, for a feature article spot in the next *QRP Quarterly,* and for possible project kitting, courtesy of the QRP ARCI. All are invited.

QRP Symposium presenters

Please submit your QRP technical manuscripts to FDIM 99 Technical Paper Chairperson George Heron N2APB, 45 Fieldstone Trail, Sparta NJ 07871, [n2apb@amsat.org]. FDIM 99 QRP Symposium Proceedings will be available for sale during and after the Conference for those unable to attend the Symposium.

FDIM QRP Symposium registration

Registration for the Thursday, May 13, 1999 FDIM QRP Symposium will be $10 if prepaid by May 1, 1999, and $12 after that date, or at the door. "At the

Number 54 on your Feedback card

Special Events

Listings are free of charge as space permits. Please send us your Special Event two months in advance of the issue you want it to appear in. For example, if you want it to appear in the August issue, we should receive it by May 31. Provide a clear, concise summary of the essential details about your Special Event.

MAY 1

CADILLAC, MI The Wexaukee ARC will hold their annual Amateur Radio and Computer Swap Meet 8 a.m.–1 p.m. at the Cadillac Middle School. VE exams for all classes at 1 p.m. Admission $5; 8-ft. table $6. Setup at 6 a.m., table holders only. Talk-in on 146.98 rptr. Contact *Dan KE8KU, Wexaukee ARC, P.O. Box 163, Cadillac MI 49601. Tel. (616) 775-0998; E-mail [ke8kudan@juno.com].*

CEDARBURG, WI The 21st Annual Cedarburg Swapfest will be held 8 a.m.–1 p.m. at the Circle-B Recreation Center, Hwy. 60 and County I (located 20 miles north of Milwaukee, west of Grafton). Admission is $4 in advance and $4 at the door. 4-ft. tables are $5 (limited power available on request). Sellers' setup at 6:30 a.m. VE exams start at 9 a.m. For admission tickets, table reservations, maps, or more info, send an SASE to *Joe Holly, ORC Swapfest Chairman, 1702 Holly Lane, Grafton WI 53024. Tel. (414) 377-2137;* or *Skip Douglas at (414) 284-3271.* This event is being sponsored by the Ozaukee Radio Club of Mequon WI.

MONUMENT, CO The Pikes Peak Radio Amateur Assn. Gigantic Hamfest will be held on May 1st, 0800–1400, at Lewis-Palmer High School, 1300 E. Higby Rd., I-25 between exit 158 and 161. Free parking. Admission is $4 for 18 and over. VE exams at 1000, forums, APRS, packet, satellite demos. Vendor setup Fri. eve. at 1800, Sat. morning at 0600. Tables $12, $10 ea. additional. Talk-in on 146.97 (100 Hz) and 146.52. For tables, contact *Dennis NØABC, (719) 535-1160, [dennis.major@mci.com];* or *Bob KIØGF, (719) 265-9950, [rryals@pcisys.net].* Write to *PPRAA, P.O. Box 16521, Colorado Springs CO 80935.* Check the Web site at *[http://www.qsl.net/ppraa/].*

ST. LOUIS, MO All-day Skywarn Weather Observation Training will be offered Sat., May 1st. Level 1 Training will be presented in the morning, and classes resume in the afternoon with the SKYWARN Level 2 Program. For locations, call the *Severe Weather Information Line, (314) 889-2857* for a taped message and additional information. All are welcome. Free parking. Certification provided for R.A.C.E.S. and SKYWARN at no cost.

MAY 1–2

ABILENE, TX The Key City ARC will sponsor the West Texas Section Convention and Hamfest at the Abilene Civic Center, Sat., May 1st, 8 a.m.–5 p.m., and Sun., May 2nd, 9 a.m.–2 p.m. Free parking. VE exams. Wheelchair access. Limited RV parking for a nominal fee. Tables $6. Pre-registration for the prize drawing is $7 (must be received by April 27th), $8 at the door. Talk-in on 146.160/.760. For reservations and info, contact *Peg Richard, 1442 Lakeside Dr., Abilene TX 79602. Tel. (915) 672-8889.*

MAY 2

YONKERS, NY The Metro 70cm Network will present another Giant Electronic Flea Market at Lincoln High School, Kneeland Ave., Yonkers NY, 9 a.m.–3 p.m., rain or shine. Free parking. No tailgating. Indoor flea market only. Pre-registered tables, vendors $19 first table, $15 each additional table. All tables 30-ft. x 5-ft., or bring your own tables at $14 for a 6-ft. space. Full payment is due with registration. At the door, each table is $25, or $20 for a 6-ft. space. Mail paid reservations to *Metro 70 CM Network, 53 Hayward St., Yonkers NY 10704.* No paid reservations for space will be held past 9 a.m. No refunds given unless prior notification of cancellation has been received 72 hours in advance of this event. Table setups 7 a.m. For registration, call *Otto Supliski WB2SLQ,*

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door" registration may be limited if, once again, we sell out. Please register early to guarantee a seat. Registration will cover a full day of QRP Symposium activities, including the QRP technical presentations and an endless QRO coffee pot. The $10 registration fee also includes a complimentary copy of the FDIM 98 QRP Symposium Proceedings.

Please send your $10 registration fee (US check, money order, international money order) made out to "QRP ARCI" and an SASE by May 1, 1999, to: Philip Specht, 925 Saddle Ridge, Roswell GA 30076 USA, or E-mail [k4pqc@bellsouth.net] for information. Along with your registration check, please provide the name, US mail address, telephone number and E-mail address of each attendee. Also provide callsign(s) if available and a self-addressed stamped envelope if return confirmation is desired.

Awards Banquet registration

This not-to-be-missed Friday, May 14, 1999, event is being hosted by FDIM Banquet Chairperson Scott Rosenfeld NF3I. Please send your $25 banquet ticket fee (US check, money order, international money order) made out to "QRP ARCI" and an SASE by May 1, 1999, to: Scott Rosenfeld NF3I, QRP ARCI Banquet Tickets, 2250 Paterson St. 50, Eugene OR 97405-2988 USA. Along with your registration check, please provide the name, US mail address, telephone number and E-mail address of each attendee. Also provide callsign(s) if available and a self-addressed stamped envelope if return confirmation is desired.

FDIM QRP Vendor Social

A tradition was started several years ago—a special evening was set aside to officially introduce our QRP vendors from around the world. This year, all are invited to attend this wonderful gathering of vendors during each of the three evenings' socials. Jim Stafford W4QO, QRP ARCI vice president, will be the host this year. QRP vendors—for registration information, please contact Jim Stafford W4QO, QRP Vendor Evening Chairperson, at 11395 West Road, Roswell GA 30075, or via E-mail: [w4qo@amsat.org].

QRP ARCI FDIM headquarters

The Days Inn Dayton South (DIDS) will be the 1999 FDIM QRP headquarters. Hank Kohl K8DD has arranged a special block of reduced-rate rooms to be held at the hotel for FDIM attendees wishing to conveniently stay at the ARCI headquarters for the weekend festivities. Rooms are $72/night (+ tax) with as many occupants as desired. Let Hank know if you will be needing one of these special rate rooms. He can be reached at: QRP-ARCI Rooms, 1640 Henry, Port Huron MI 48060-2523 USA. You can also contact Hank by E-mail at: [k8dd@contesting.com].

On behalf of the QRP ARCI team, we invite you all to join us for the QRP Event of 1999—the "Four Days In May" 99 QRP Conference at the 1999 Dayton Hamvention. See you all there! 73/72, *Ken Evans W4DU, FDIM 99 Chairperson. E-mail: [w4du@bellsouth.net].*

(914) 969-1053. Donation $6, kids under 12 free. Talk-in on 440.425 MHz, PL 156.7; 223.760 MHz PL 67.0; 146.910 MHz; and 443.350 MHz PL 156.7.

MAY 8

MANITOWOC, WI The Mancorad Radio Club will hold their 1999 Hamfest and Computer Swapfest at the Manitowoc County Expo Center, intersection of Hwys. 42-151 and I-43 on Co. R, 8 a.m.–noon. Features include an amateur/computer/electronic flea market, and VE exams. Admission is $3 in advance or $4 at the door. Dealer setup Fri. 6 p.m.–9 p.m., or Sat. at 6 a.m. 8-ft. tables $6, electric outlet $5. SASE to *Mancorad RC, P.O. Box 204, Manitowoc WI 54221-0204;* or call *Red (920) 684-3733;* or *Fred at (920) 682-9312.* For camping arrangements, call *(920) 683-4378.*

MAY 15

GRIMESLAND, NC The East Carolina Antique Radio Club Swap Meet, "ECARC Radiofeast 1999," will be held 8 a.m.–3 p.m. in the East Carolina Radio Museum parking lot at 7602 Pitt St. in Grimesland. Hwy. 33, 10 miles east of Greenville NC. Free admission. Tailgate space $7. Contact *Bill Engstrom, 218 Bent Creek Rd., Greenville NC 27834, (252) 355-8732; or Herman Schnur K4CTG, 3205 Brick Kiln Rd., Greenville NC 27858, (252) 752-2264.*

MAY 22

LONDONDERRY, NH The Interstate Repeater Society will hold an Amateur Radio Swap Meet on Sat., May 22nd, at the Londonderry Lions Club on Mammoth Road. Dealer setup starts at 6 a.m., and general admission ($2) at 8 a.m. Dealer spaces are $10. Inside and outside spaces available. Directions: Rt. 93 to Exit 4, west on Rt. 102 about 2 miles to Mammoth Rd. (Rt. 128). Go north about 1-1/2 miles to the hall on the right. For reservations call *Paul K1LL, (603) 432-1538; or E-mail to [K1LLX@juno.com].*

MAY 23

FAIR OAKS, CA The North Hills Radio Club of Sacramento CA will hold its annual Swapmeet, 6 a.m.–12 p.m., at the Bella Vista High School, 8301 Madison Ave., Fair Oaks CA. From I-80, take Madison Ave. east for 5.8 miles to the high school. From Hwy. 50, take Hazel Ave. north 2.6 miles to Madison Ave., turn left and go west 1.4 miles to the high school. Seller spaces $10 (two parking spaces), buyers admitted free. New, used, and surplus amateur radio gear, electronic test equip., and amateur-related computer gear. Contact *Earl Mead K6ESM, (916) 331-1115; or E-mail [nhrc@k6is.org].*

MAY 30

WEST FRIENDSHIP, MD The Maryland FM Assn. of Hanover MD will hold the MFMA Hamfest on May 30th, 8 a.m.–2:30 p.m. at Howard Co. Fairgrounds. Take 170 to Rte. 32, south to Rte. 144, turn right, go west on Rte. 144, approx. 1 mi. to the Fairgrounds. Talk-in on 146.76, 224.76, or 444.00. Admission $5, tables in advance $20, $25 at the door. Tailgate spaces $5 ea. For reservations, contact *Craig WA3TID, P.O. Box 19, Annapolis Junction MD 20701. Tel. (410) 987-6042.*

JUNE 5

BANGOR, ME The 12th Annual Bangor Hamfest will be sponsored by the Pine State ARC, 08:00–13:00, at Hermon High School. Take I-95 to Exit 44 (Cold Brook Rd.) to US #2; US #2 west 1 mile to the high school. From the village, take US #2 east 1/2 mile to the school. Talk-in on 146.34/.94 and 146.52. VE exams will be held for all classes. Features: Vintage equipment, a fox hunt, FSTV, VHF, packet, antenna feeds. Set up a ham shack to help newcomers. Admission $4 per person, under 12 years free. Tables $8 each. Equipment will be auctioned at the end of the hamfest. There are campgrounds and many motels within 5 miles. This event will be held rain or shine. Contact *Robert W. Dole KA1TKS, RR #2 Box 730, Bangor ME 04401. Tel. (207) 848-3846.*

GRAND RAPIDS, MI The annually sponsored IRA Hamfestival, west Michigan's largest hamfest, will be held June 5th at the Hudsonville Fairgrounds near Grand Rapids. Doors open at 8 a.m. for general admission. Dealers can setup on the 4th after 7 p.m., or after 6 a.m. on the 5th. Overnight camping is available. This year's swap will host 5 technical seminars, the Michigan Area Repeater Council June quarterly meeting, and the State and District 6 Emergency Coordinators will provide a forum entitled "Y2K and Amateur Radio." VE exams at 12 noon. Talk-in on 147.16 link repeater system. Indoor table space and trunk sales spaces are available. Contact *Kathy at (616) 698-6627 between 4 p.m. and 7 p.m. EST.*

HOUSTON, MO The 1st Annual Central Ozarks Hamfest will be held by the Ozark Mountain Repeater Group, 8 a.m.–3 p.m. at Texas County Fairgrounds, 1.5 miles north of Houston MO, on Highway 63. Setup at 6 a.m. Trade tables $10, or outside space $5. Commercial tables $15. Talk-in on 146.850. Contact *Bob Simpson NØNTC, 9570 Haney Drive, Houston MO 65483. Tel. (417) 967-3535, or E-mail [nØntc@train.missouri.org].*

SPRINGFIELD, IL The Sagamon Valley Radio Club will join with the Shooting Stars 4-H Club to present a Hamfest at Illinois State Fairgrounds in Springfield. Free parking. ARRL VE exams. Indoor exhibits. Talk-in on 146.685(-). Admission $5. Visit the web site at [www.skylight1.com/svrc/]. Contact *Ed Gaffney KA9ETP, 13997 Frazee Rd. Box 14A, Divernon IL 62530. Tel. (217) 628-3697, or E-mail [egaffney@fgi.net].*

TEANECK, NJ The Bergen ARA will hold its annual Spring Hamfest at Fairleigh Dickinson University. Take Rte 4 east/west to the River Road exit. Follow the signs into the hamfest area. Buyer admission $5, with XYLs and harmonics free. Seller admission $10. Plenty of parking. VE exams. Talk-in on 146.790(-600). For more info call *Jim Joyce K2ZO at (201) 664-6725 before 10 p.m.*

JUNE 6

BUTLER, PA The 45th Breezeshooters' Hamfest will be held Sun. June 6th, 8 a.m.–4 p.m. on the Butler Farm Show grounds, just north of Butler. Admission is $5 per person, includes prize drawings during the hamfest; children under 12 admitted free. To reach the hamfest, take PA Rt. 68 East from Interstate 79, or take US Rt. 68 West from PA Rt. 8. Talk-in on 147.96/.36. Facilities are handicapped accessible. Tailgate spaces $5 each. Dealers can rent tables in advance at $15 per table. Reservation deadline is May 15th. To reserve a table, send check for $15 per table and an SASE to *Rey Whanger W3BIS, Hamfest Chairman, 5430 Cove Run Road, Cheswick PA 15024; or call (412) 828-9383.* E-mail can be sent to *[w3bis@freewwweb.com].* The Web site is at *[www.breezeshooters.com].*

MANASSAS, VA The Manassas Hamfest, Amateur Radio, Electronics & Computer Show is being presented by Ole Virginia Hams ARC, Inc., Sun. June 6th at Prince William County Fairgrounds (1/2 mile south of Manassas VA on Rte 234). Talk-in on 146.97(-) and 224.660(-). Indoor exhibitor space has 8-ft. tables and electricity. Setup 2 p.m.–8 p.m. Sat. General admission $5 per person at the gate. No advance sale. Gates open at 8 a.m. Free parking. Tailgate spaces $5 (plus admission), gates open at 7 a.m. ARRL Roanoke Div. officers will be attending. DXCC QSL Card Checkers will be available. There will also be a "Virginia QSO Party" Award Ceremony. You can find hamfest details on the Web at *[http://www.qsl.net/olevahams].* For dealer info contact *Jack N4YIC, (703) 335-9139; E-mail [patnjack@erols.com].* For general info, contact *Mary Lu KB4EFP, (703) 369-2877; E-mail [mblasd1638@aol.com].*

MEDINA, OH Join the M2M Group for the 1999 Medina County Hamfest, Sun., June 6th, at the Medina County Fairgrounds Community Center, 735 Lafayette Road, in Medina. Vendor setup at 6:30 a.m. Open to the public 8 a.m.–3 p.m. New and used ham gear and computer equipment will be featured. Talk-in on 147.630/.030. General admission $4 in advance, $5 at the door. Inside tables $9 in advance, $10 at the door. Flea market spaces $7 in advance, $8 at the door. Please call Doug at (330) 725-0119 for info about VE exams; walk-Ins welcome. For tickets and general info, contact *Mike at (330) 273-1519, or E-mail [m2mgroup@*

aol.com]. Vendors please note: No tables will be reserved without payment. Prepaid tables will be held until 9 a.m. Send payments with an SASE to the *Medina Hamfest Committee, P.O. Box 452, Medina OH 44258,* before May 22nd.

QUEENS, NY The Hall of Science ARC Hamfest will be held at the New York Hall of Science parking lot, Flushing Meadow Corona Park, 47-01 111th St., Queens. Doors open for vendor setup at 7:30 a.m. Buyers admitted at 9 a.m. Free parking. Admission by donation, buyers $5, sellers $10 per space. Talk-in on 444.200 rptr., PL 136.5, 146.52 simplex. For further info call evenings, *Stephen Greenbaum WB2KDG, (718) 898-5599; or E-mail [WB2KDG@Bigfoot.com].*

JUNE 12

FERGUS, ONTARIO, CANADA The Guelph ARC and Kitchener-Waterloo ARC, Inc. are getting together to jointly sponsor The Central Ontario Amateur Radio Fleamarket. The event will be held 8 a.m. to 2 p.m. at the Fergus Community Center. Vendors admitted from 6 a.m. Talk-in on 146.97(-) or 145.21(-). Contact *Bill Smith VE3WHS, 32 McEiderry Rd., Guelph ON, Canada N1G 4K6. Tel. (519) 821-6642. Packet [VE3WHS@VA3SED.#SWON.ON.CA.NA]. E-mail: [smith.ve3whs@sympatico.ca].*

JUNE 13

INDEPENDENCE, KY The Northern Kentucky ARC will hold their "Ham-O-Rama '99'" on Sun., June 13th at the Summit View Middle School in Independence KY. From I-75 go east on I-275 to Exit 80 (Covington/Independence–KY 17). South on KY 17 (towards Independence) 5-1/4 miles. For more info or reservations, contact *N8JMV c/o NKARC, P.O. Box 1062, Covington KY 41012; or call (513) 797-7252 in the evening.* Indoor exhibit area for major vendors. Extensive outside flea market with setup at 6 a.m. General admission begins at 8 a.m. Admission $4 in advance, $5 at the gate. Children under 14 admitted free. Flea market spaces $2 each (tables not furnished). Indoor vendor space $15 per table provided. Talk-in on 147.255(+) and 147.375(+) rptrs.

KNOXVILLE, TN The Radio Amateur Club of Knoxville is sponsoring the 33rd annual "Knoxville Hamfest and Electronics Flea Market" on June 13th at the National Guard Armory, 3330 Sutherland Ave., in Knoxville. Open to the public 9 a.m.–4 p.m. Admission $5. 8-ft. tables will be supplied for $15 each. AC power also available. Free dealer passes will be provided for all designated workers. Free beverages available for all inside dealers. Access for dealers and other indoor participants starts Sat., June 12th, 12 noon–8 p.m. ET. Access also available on the day of the hamfest, starting at 6 a.m. ET. Free parking and handicap access. Free outdoor tailgate space with each paid admission. VE exams begin at 2 p.m., registration must be completed before 1:30 p.m. Test fee is $6.45, payable to WCARS/VEC, exact cash or check, please. There will be a clinic showing how to use new technology ham radio equipment. A free product literature and product promotional items area will also be featured. Forums are being planned to discuss ham radio in the next century, public service activities, computer architecture, new FCC regulations, DX, etc. Exhibits will feature new technology equipment, satellite communications and emergency communication equipment. Talk-in on W4BBB 147.30(+), 224.50(-), 444.575(+). For general info and reservations, contact *David Bower K4PZT, P.O. Box 50514, Knoxville TN 37950-0514. Tel. (423) 974-5064 (w) or (423) 670-1503 (h). E-mail [rack@korrnet.org].* For updated info check the Web page at *[http://www.korrnet.org/rack].*

SUFFIELD, OH The 32nd Annual Hamfest and Family Picnic will be sponsored 8 a.m.–4 p.m. by the Goodyear ARC at the Goodyear Wingfoot Lake Park, located near Suffield OH, 10 miles east of Akron. Enter from Rt. 43, one mile south of Rt. 224. Admission $4 in advance or $5 at the door. One ticket admits ham, spouse and children. Flea market spaces $10 each or $8 in advance. Vendors (Pavilion) $8 in advance or $10 the day of the hamfest. Make checks payable to the Goodyear ARC and mail with an SASE to *David R. White, 719 Notre Dame, Cuyahoga Falls OH 44221.* VE exams available. For more info call *Dave White at (330) 928-7625 or E-mail [rjtaylor@akron.infi.net].* Talk-in on 146.985/.520. Park rules: No pets, no firearms, no pornographic materials.

WHEATON, IL The Six Meter Club of Chicago, Inc., will hold its 42nd Annual ARRL sponsored Hamfest at the DuPage County Fairgrounds, 2015 Manchester Road [north of Roosevelt Road (Route. 38), east of County Farm Road], in Wheaton. Free parking. No extra charge for space in the outdoor flea market. Tickets are $5 in advance, for attendees over age 12, $6 at the gate. Advance tickets are available from *Joseph Gutwein WA9RIJ, 7109 Blackburn Ave., Downers Grove IL 60516,* or from any club member. Commercial tables, 8-ft. w/110V $15 each. Indoor flea market tables, 8-ft., no electric, $12 each. Overnight RV parking, includes electrical hookup, $10 each. Send an SASE with check or m.o. payable to *Six Meter Club of Chicago,* and mail to *7109 Blackburn Ave., Downers Grove IL 60516,* no later than May 30th. For information call the 24-hour InfoLine, *(708) 442-4961.* Buildings are open to the public at 8 a.m. VE exams 9 a.m.–11 a.m., call the InfoLine to pre-register for testing. Handicap parking at the east gate. General parking at the west gate. Sellers, use east gate. Absolutely no alcoholic beverages permitted. All sellers responsible for cleanup of their spaces.

JUNE 18, 19, 20

RED DEER, ALBERTA, CANADA The Central Alberta Radio League (C.A.R.L.) will host its 29th Annual Picnic and Hamfest at the Burbank Campsite located approximately 8 km NE of Red Deer. Talk-in on 147.150 (+600) or 146.520 simplex. For info contact *Bob VE6BLD, 5540 54th Ave., Lacombe, Alberta, Canada T4L 1L6. Tel. (403) 782-3438 evenings. E-mail [kingel@telusplanet.net] or [ve6bld@rac.ca].* Or E-mail *C.A.R.L. at [carl@qsl.net].* Visit the home page at *[http://qsl.net/carl/]. Bill VE6WMG, at (403) 749-2063,* is also available to relay more info about this event.

SPECIAL EVENT STATIONS

APR 30–MAY 2

AQUINAH, MA The Fall River ARC will work stations for the Massachusetts QSO Party by operating W1ACT/P from the Gay Head lighthouse on Martha's Vineyard island (IOTA NA046) 1600 UTC April 30th–2100 UTC May 2nd. Tune in on 3.755 MHz, 14.260 MHz, 21.260 MHz, and 28.460 MHz. QSL with an SASE to *Roland Daignault N1JOY. E-mail [roland-d@ici.net].*

MAY 8–9

INDIANA QSO PARTY The Land of Lakes ARC will host the Indiana QSO Party, 1800Z May 8th–2300Z May 9th. Categories: Single operator, multi-operator, club station and VHF/UHF. All stations may be worked once per mode on each band by CW and phone. Mobiles may be worked once per mode per Indiana county that they operate from. No repeater contacts. Exchange: Indiana stations—signal report and county: non-Indiana stations—send signal report, state, province, or county. Phone contacts count 2 QSO points, all other modes count 3 QSO points. Suggested freqs.: CW—1810, 3539, 3715, 7045, 7115, 14045, 21045, 21120, 28045, 28120. Phone—1860, 3890, 7280, 14285, 21385, 28400, 50.14, 144.215, 432.120. Certificates will be awarded for first and second place in each category, state, province and country. Send logs with an SASE to *Sharon Brown, 905 W. Parkway Dr., Pleasant Lake IN 46779.* You may also submit logs via E-mail to *[sharon.l.brown@gte.net].* Logs must be received by June 11th, 1999.

JUNE 12, 13

PORTUGAL DAY DX CONTEST The Rede dos Emissores Portugueses will sponsor the Portugal Day DX Contest on phone (SSB) only, on 10 15, 20, 40 and 80 meters, using the recommended IARU band plan for Region 1. For more information, contact *REP—Rede dos Emissores Portugueses, Award/Contest Manager, P.O. Box 2483, 1112 Lisboa Codex, Portugal.*

QRX

continued from page 39

via *World Radio*, via *The Independent Bohemian* (FL), KD4VBI, editor, [kd4vbi@juno.com].

Jerry Skywalker

Amateur radio operators have been erecting antennas since the earliest days of radio. So, perhaps it is apropos that it would be an amateur radio operator—putting up another set of antennas—who would help to write a new chapter in space communications.

The ham radio operator is Jerry Ross N5SCW. He was part of the all-ham crew that flew mission STS-37 in the early 1990s. And now, Jerry was one of two astronauts who ventured out on a spacewalk on Wednesday, December 9th, to attach the antennas to the first United States section of the international space station. The module is called *Unity*.

This was the second of three excursions outside the shuttle *Endeavour* for Ross and James Newman in less than a week. They completed installing two 100-pound antennas on *Unity* at about the three-and-one-half-hours point of a planned seven-hour spacewalk. They then successfully pried open a stuck antenna on the Russian-built *Zarya* space station module.

Even with the antenna repair, the spacewalk was not nearly as difficult as the one on Monday, December 7th. During that excursion, Ross and Newman hooked up forty electrical connections between *Zarya* and *Unity*. This essentially tied the two together as the first stages of the ISS.

But the antennas that Ross and Newman installed outside of the *Unity* module may be just as important. They are part of an elaborate communications system between *Unity* and NASA's Mission Control. Once activated, the system will provide a direct, virtually uninterrupted communications link between the two without having to rely on Russian ground stations for relay.

Rounding out the mission, Ross and Newman also took a third spacewalk and checked out the new space station. And typical of ham radio operation, they kicked those stuck antennas—freeing them for future work when Russian spacecraft come in to dock.

All of this totaled seven spacewalks for N5SCW during his 18-year career as an astronaut. That's the most spacewalks by any American.

Tnx and a flip of the helmet visor to *Newsline*, Bill Pasternak WA6ITF, editor.

War of the Worlds

Call it life imitating art last year. When a Portuguese radio station decided to repeat Orson Welles' famous *War of the Worlds* broadcast, the results were predictable. Graham Kemp VK4BB of *Q-News* reported on the Martians taking on Lisbon:

... On Friday, October 30th, radio station Antena 3, in Lisbon, celebrated the 60th anniversary of the Orson Welles radio drama *War of the Worlds* by rebroadcasting it during the morning show.

The original Welles script was used and translated into Portuguese. The station issued a warning at 7 a.m., announcing their intention to broadcast the radio play. But when the play began an hour later at 8 a.m., panic erupted.

The station broadcast the landing of a UFO at Palmela, and the bulletins said that the Martians had set off in the direction of the capital (Lisbon) and that military forces sent to stop them had proved powerless.

The program's producer said the radio station was inundated with calls from hundreds of panicking people demanding to know what was going on.

The 7 a.m. warning proved worthless because not everyone is listening to the radio that early. Some callers said they had fled their workplaces. Others with health problems complained that their health had deteriorated on news of the Martian invasion.

One of the organizers of the broadcast said, "One hundred years after the invention of the radio, there are still people who will believe anything." ...

All this goes to prove that even sixty years later, some people in radio just never seem to learn.

Tnx and a "run for your life!" to *Q-News*, courtesy of *Newsline*, Bill Pasternak WA6ITF, editor.

grow up and be workers? Ditto your grandkids? All, essentially, members of a giant ant colony or beehive?

Well, golly, we have to work for a living, don't we? Sure, but we don't have to work for someone else all our lives. If you have your own company, you can work for yourself. It's bad enough that, by the time you count up all the taxes, you're working almost half of your life for the government — so Congress and your state legislature can have a ball spending our money.

But, if you have your own company, you set your hours — you set your pay — you set your vacations. And if you make your company one that does business worldwide, you can travel anywhere you want, too. *73* magazine has subscribers in over 200 countries, so anywhere I go I have friends and a group anxious to show me around and listen to me talk.

A few weeks ago Sherry and I took off a few days and visited Iceland. The hams there couldn't have been more friendly. But it's that way everywhere I've been.

When I was interested in Italian greyhounds I naturally started a small magazine on the subject, and that led me to visit Italian greyhound lovers all around the US, in England, Sweden, and several other countries. It was the same when I started publishing computer magazines — they even paid my way to South Africa to address a computer conference there! And I gave talks on computers in many other countries on all continents.

My book, the *Secret Guide to Wealth*, explains how you can get other people to pay you to learn what you need to know to run your own business. Or you can be another ant in the colony.

Global Baloney

The media, led by Veep Gore, are insisting that we spend hundreds of billions of dollars and sacrifice hundreds of thousands of jobs to prevent global warming. What you're not seeing much of are the reports from scientists who are calling the whole thing a bunch of unsubstantiated political hogwash.

Then there's a petition that says, "There is no convincing scientific evidence that the human release of carbon dioxide, methane, or other greenhouse gases is causing (or will in the foreseeable future cause) catastrophic heating of the Earth's atmosphere and disruption of the Earth's climate. Moreover, there is substantial scientific evidence that increases in atmospheric carbon dioxide produce many beneficial effects on the natural plant and animal environments of the Earth."

Did this come from some PR agency or anti-environmentalists? No, it's a petition signed by nearly 17,000 US scientists, most trained in the fields of physics, climate science, chemistry, biology, or biochemistry. They point out that there is no basis for believing that human activity is leading to global warming.

This is disturbing news for the bad news bears. The media, as you well know, have found that bad news sells papers, so they've developed their skill for finding and exaggerating bad news, whether it's accurate or not.

More than 100 leading climatologists have denounced last year's Kyoto treaty as, "dangerously simplistic, quite ineffective, and economically destructive."

This is another case where politicians have their own agenda, and are running roughshod over scientists. It wasn't very long ago that a vocal few alarmists got the media busy scaring us about global cooling. They were wrong then and they're wrong again. Big surprise.

Loyal League Member

The term "loyal" suggests unquestioning subservience. And that's what I've run into with loyal League members. You've probably heard about the longest word in the English language, antidisestablishmentarianism, but I'll bet you've never given much thought about what it means. If you think about it, it means someone who is opposed to anyone who is opposed to the establishment.

Like you and everyone else, I was taught to believe in the establishment. We're taught this by our families, schools and the media. It then came as quite a shock to me to find that in every case, as I looked into what the establishment was doing, I found it was phony.

Down through the years I've known quite a few of the ARRL directors personally. I can't remember *any* who did not hold the local ARRL members in contempt. One of the directors, many years ago, made the mistake of sending letters to the other directors telling what he and they were thinking. Copies of his letters got around, with some being sent to me. These were the infamous Doyle letters.

As I understood it, Doyle was the midwest director and he'd made his money as a war profiteer. He was blunt about how stupid he thought most of the ARRL members were, and he put in writing that Budlong, the General Manager, had no problem making sure that the directors he wanted would get elected, and none other. He expressed his annoyance when the Louisiana members elected a "Hymie" lawyer as their director.

A few years later multi-millionaire Mort Kahn W2KR bought his way in as the Hudson Division director by sending letters to all of the Hudson Division hams. He quickly engineered the firing of Budlong and took over running the League by proxy from his director's position.

Wake-Up Call

While our old-timers are busy doing their very best to kill what's left of amateur radio with their insistence on maintaining the code barrier to a license, technology is leaving our hobby so far behind that we're more like antique collectors that technologists.

Have you been reading about WDM? That's wavelength division multiplexing and it's increasing the ability of fiber-optic systems to where one fiber will be able to deliver the entire contents of the Library of Congress in one second. As systems like this are brought on line, not just to communications centers, but into homes, the cost of communicating will be inconsequential. We're talking about being able to request any movie or old TV program when we want it.

The possibilities are mind-boggling. Many low-budget movies which have disappeared can be made available, including a wealth of 16mm films. I used to go to Cinema-16 in New York, where they showed some superb films that people would love to see, if they were available and there was some way to know about them.

An old buddy of mine, WA3YQY (he used to be W2MKO when we were in high school), is busy putting his 35mm slides into video programs, complete with commentary, à la the Civil War series on PBS. I'd love to see personal travelogue slides or videos done by people who have visited places I'd like to see — like those countries in West Africa, for instance.

Fifteen years ago I got an inside look at a service being pioneered in England where homes were wired with cable and the customers could request any movie they wanted when they wanted it. The system also provided for shopping, too, with customers able to request video information on a wide variety of products.

The Internet is getting close to this, so it won't be long before we'll be able to see a manufacturer's demonstration and sales pitch for almost any product (or service), and then be able to price shop for a supplier. Eventually this approach could eliminate most of the middlemen now needed — like sales reps, distributors and even retailers. Manufacturers could almost all sell direct. Maybe this is a good time to start selling any stocks you have in distributing companies.

Many of the bulkier and heavier products will have to be delivered from local warehouses, but there won't be the overhead of an expensive storefront, salesmen, management, and retail advertising.

Meanwhile, we amateurs are speeding along at 13 words per minute. Snore.

Hong Kong

Having visited Hong Kong many times, and having some good friends living there, I tend to pay more attention to news about the city than you might. It should be no surprise that despite promises and agreements, China has been slowly taking away freedom from the people. A new move could seriously undermine Hong Kong's future. The government has recently stopped teaching in English in all but 100 selected schools. Since the main future of business is in high technology, and since English is the only true international technology language, this move could severely hobble Hong Kong's coming generation of engineers and technicians.

Hong Kong's main competitor is Singapore, but India is coming up fast, with an abundance of well educated engineers who can speak and write excellent English.

Iridium

Iridium's 66 satellites are beginning to be used, but I suspect there are some serious problems with the system which may not be revealed. Like what? Like the problem of getting a line-of-sight shot at the satellites when you're in a city full of tall buildings. Which is where most cell phone users seem to be. Iridium's CEO says that 85% of Iridium calls are completed. They're aiming at soon having 98% of them completed.

Well, I suppose if you're a frequent visitor to the Australian outback this service could be handy.

This stuff isn't cheap, at least not yet. The phone costs $3,395, plus a $69 a month service charge, and $2 to $7 a minute for calls. I can't think of anyone I want to talk with that badly.

With the overhead of all those satellites, it's no wonder the service is expensive. It costs a bazillion to put them up there, plus all the earth stations to link them. US calls are forwarded to Arizona, where a computer makes sure your bill has been paid before forwarding your call, usually through a fiber-optic cable, to the city you're calling.

It'll be a while before little problems such as taking the phone through customs of some countries is worked out, as well as the telephoning costs from different countries.

But the voice quality is superb, so that's a plus. Jim Hong KA8ZGP had a beta unit with him at Aspen, so I was able to talk right from the ski slopes in Aspen to my friend Rob Burr in Coral Gables as a test with a beautifully clear connection. Well, there's a slight delay due to the distance to and from the satellites. A fraction of a second, but it takes getting used to. It reminded me of the many ham satellite contacts I made.

Melatonic

Reader Ron N2ARQ sent me some interesting data on melatonin via a doctor newsletter. Recent research has shown that the body's ability to make melatonin is very important to its health and that supplements, while helpful, are not nearly as effective. So what can you do to keep your body generating melatonin? One important factor is keeping your bedroom dark. Even a short exposure to light stops melatonic production. And it isn't just your eyes that sense light. Researchers have shown that the back of the knee is almost as sensitive to light as your eyes.

Well, we know that rabbits are able to sense changes in light with some sort of sensing system on the back of their neck, so that isn't really surprising.

Another melatonic stopper is EMFs from a nearby clock, radio, or TV set. Keep 'em at least six feet away from your bed. The worst EMF offenders are electric blankets. It's no wonder researchers have tied cancer, birth defects, and miscarriages to them.

The light during nighttime bathroom trips can interrupt your melatonic production. You'll do better if you can use a small night light so you won't have to turn on the regular light. One of those tiny wall lights that turn on when the lights go off and make it so you can walk around.

If you know someone who is hard to get along with, sleeps far too many hours a night, and is depressed and tired, you might see if they are sleeping with a room light on or a TV. I know this sounds crazy, but there are a few people who leave their TV on all night and somehow manage to sleep (fitfully) through the light and noise. These are generally not pleasant people to be around or deal with.

Smaller Is Better!

Platt Monfort has self-published a delightful little book, *Evolution — The Next Step.* In it he points out that mankind has grown a foot in the last 150 years, and with the need for even bigger basketball players, we're doing our best to add still another foot to our height.

But how about making us smaller? Platt makes a very good case for this, pointing out that our ancestors were much smaller (remember Lucie?). If we cut back to three-foot people we'd be able to have much smaller cars that would use less fuel, have homes an eighth the current size, and need to grow an eighth as much food.

That's right, an eighth! Think about it. If you take a two-foot cube and take a one-foot cube out of it, you've still seven one-foot cubes left.

And smaller is stronger. An ant can lift 15 times its own weight. And run with it.

We could fit eight times as many people into planes. And trains, if we're still using 'em.

The booklet (25 pages) is a fun read and makes sense. It's $4 from Platt Monfort, 50 Haskell Road, Westport ME 04578.

If you've visited the *Mayflower* you've been surprised at how small the bunks were. Well, they fit the people in those days. Ditto if you've seen the beds in the old castles. People were shorter, Randy Newman notwithstanding.

With three-foot people our compact cars could really be compact! Our computer keyboards would be smaller, houses 1/2-size, and our food supply would go eight times

farther. Hey. Munchkin Land!

Alien Implants

UFOs, alien abductions, crop circles, and other such mumbo-jumbo tabloid crapola have many people in denial. Most of the stuff I've seen on TV has been sensationalized and seems more aimed at discrediting what's going on than informing us. To get more reliable information you really have to be able to read, a skill that's no longer being taught in our schools and which seems by most people to be considered possibly satanic.

In the hopes that there are still some people who are interested in being informed, I've been reviewing books I've found to be reliable on these offbeat subjects ... in the hopes that I can convince at least a few people to inform themselves beyond the TV and tabloid fare.

It takes a pathological skeptic to remain unconvinced that there are thousands of people who have had alien abduction experiences. Professor Mack, the Pulitzer Prize-winning Harvard psychiatrist, reported in *Abduction — Human Encounters With Aliens* on his research into the subject. But I couldn't get you to spend $7 for the pocket book edition. Or to spend $5 for Whitley Strieber's *Communion*, the story of his many alien encounters. Is it that people are too cheap to spend the five bucks, or too busy watching Roseanne and Jerry Springer? Or ball games? What an incredible waste of time!

So what brought on this unprovoked attack on your smug complacency? Yeah, I've just read another book you should read, but probably won't. It provoked me.

The book, *The Aliens and the Scalpel* by Dr. Roger Leir — subtitled, "Scientific Proof of Extraterrestrial Implants in Humans" — is a narrative account of Dr. Leir's experience in removing implants from abductees. I've seen some video of implant removals by Dr. Leir, and I've talked with the chap who's worked with him on the project, Derrel Sims. This stuff is real. It's happening.

The book, by Granite Publishing, Box 1429, Columbus NC 28722, ISBN 1-893183-02-5, is a $19 232-page paperback. It has a section of color photographs of implant removals and electron photomicrographs of the implants. These implants were discovered by accident through x-rays taken for other reasons and they've been found behind an ear, in a toe, a jaw, and so on. It's a fascinating story.

So what's going on with all this alien abduction stuff? Well, some time ago I reviewed Jacobs' *The Threat — The Secret Alien Agenda* for you. It explains what the aliens really want, and how they plan to get it. This book was the result of hundreds of interviews with abductees, mostly regressed under hypnosis. Their stories were remarkably consistent, once they were enabled to recall their abduction experiences.

Dr. Leir's book shows that there is now physical proof that something strange is going on. No, we don't yet understand the technology used in the implants, but then if a Pentium chip had been sent back in time just a few years the resources of the whole world wouldn't have been able to either understand what it was or to how to replicate it.

Most of the abductions involve the "greys," which apparently are some kind of biological robot. They communicate with abductees mentally and are able to pass through walls, windows and doors, to fly through the air, and also enable abductees to do the same. Weird stuff. Well, I'm not going to try and give you all the details that have been found by researchers so far — I'm just trying to get you to start reading so you can find out for yourself what's known so far.

Tea Leaves

You don't see many gypsy fortunetellers these days. I still remember my first tea leaf reading. Let me tell you about it.

Tom Jones, a Lt. Commander in the Naval Reserve, who had been working for my father on American Export Airlines, was called back for active duty in Washington when World War II started. So, when I decided it might be wiser for me to enlist than wait to be drafted, I called Tom and asked his advice. He knew about my amateur radio background, so he arranged an interview for me with Commander Bourne at the Naval Research Labs in Anticostia, Virginia, just across the river from Washington.

Bourne was favorably impressed and arranged for me to be inducted into the Navy in Washington and then for me to go through the Navy's nine-month radar school course so I could come up to speed on all the classified electronic developments.

After being inducted as a Radio Technician 3rd Class they took me to the Washington DC Navy Yard, where they explained that since they were out of uniforms right then I should come back in two weeks. Well, this was right before Christmas, so I'd be able to spend the holidays with my folks in New York. Great!

They gave me leave papers which said that I was exempt from the law which required all service personnel to wear uniforms when in public.

Cut to my grandmother and I Christmas shopping in New York and stopping at a gypsy tea room on Fifth Avenue for lunch. After lunch a gypsy came over and looked at the tea leaves left in my cup and was puzzled. She said she saw me being in the military, even though I was in civvies. She said that a TJ had recently had a big influence on my life and that I would soon be joining many others, going into a large building where I would come out with top honors.

Because I had always just squeaked by in school this didn't make a lot of sense to me. But she was right. When I returned from leave I got a pile of ill-fitting blues and a bunk in the barracks right below where the Navy band practiced every day, starting at 6 AM. What a great wake-up system.

A few days later I started school at the Bliss Electrical School in Tacoma Park, Maryland, which was on the outskirts of Washington. Three months later I graduated, top in my class. Well, the course was superb and a lot of fun. From there I opted for the Radio Materiel School on Treasure Island in San Francisco.

This school, too, was incredible! Six months later I graduated as an RT2/c. Then I had one of the biggest decisions of my life to make ... should I call Commander Bourne to cut orders transferring me to his research lab or should I join the fleet. And that's a great story which I'll tell you about some time.

When I tell people that my interest in amateur radio has brought me a lifetime of adventure, I'm not exaggerating.

The Best and Brightest?

A note from reader Guy Tanner pointed out that each new president is so bad that we tend to forget just how terrible his predecessor was.

I hope no one will argue with me that our political system has not done much of a job of electing the best and brightest of people. We were pretty happy with Reagan, the first movie star we'd ever elected. He did a nice job of playing president. But beyond that we've generally made the best we could of lousy choices.

I never shared the enthusiasm for Roosevelt. I liked Truman and Ike, but distrusted Nixon from the beginning. Kennedy was a nice chap, but I thought he was in way over his head with the job. Johnson? Ugh. Ford? Har-de-har. Carter? Give me a break! Bush? What is the matter with our political system, anyway? How did that turkey get elected? Clinton? No comment. Perot? Good grief, what a choice we had!

I suspect that smart people know better than to get into politics. From the congressmen

Continued on page 61

Barter 'n' Buy

Turn your old ham and computer gear into cash now. Sure, you can wait for a hamfest to try and dump it, but you know you'll get a far more realistic price if you have it out where 100,000 active ham potential buyers can see it, rather than the few hundred local hams who come by a flea market table. Check your attic, garage, cellar and closet shelves and get cash for your ham and computer gear before it's too old to sell. You know you're not going to use it again, so why leave it for your widow to throw out? That stuff isn't getting any younger!

The *73* Flea Market, Barter 'n' Buy, costs you peanuts (almost)—comes to 35 cents a word for individual (noncommercial!) ads and $1.00 a word for commercial ads. Don't plan on telling a long story. Use abbreviations, cram it in. But be honest. There are plenty of hams who love to fix things, so if it doesn't work, say so.

Make your list, count the words, including your call, address and phone number. Include a check or your credit card number and expiration. If you're placing a commercial ad, include an additional phone number, separate from your ad.

This is a monthly magazine, not a daily newspaper, so figure a couple months before the action starts; then be prepared. If you get too many calls, you priced it low. If you don't get many calls, too high.

So get busy. Blow the dust off, check everything out, make sure it still works right and maybe you can help make a ham newcomer or retired old timer happy with that rig you're not using now. Or you might get busy on your computer and put together a list of small gear/parts to send to those interested?

Send your ads and payment to: *73 Magazine*, Barter 'n' Buy, 70 Hancock Rd., Peterborough NH 03458 and get set for the phone calls. The deadline for the August 1999 classified ad section is June 10, 1999.

President **Clinton** probably doesn't have a copy of *Tormet's Electronics Bench Reference* but you should. check it out at [www.ohio.net/~rtormet/index.htm]—over 100 pages of circuits, tables, RF design information, sources, etc. BNB530

DFjr direction finder and MicroPLL programmable transmitter (formerly Agrelo) are now back under new management! Check exciting new accessories and upgrades. Order online at www.swssec.com or call SWS Security at 410-879-4035 (9-5 ET). BNB220

RF TRANSISTORS TUBES 2SC2879, 2SC1971, 2SC1972, MRF247, MRF455, MB8719, 2SC1307, 2SC2029, MRF454, 2SC3133, 4CX250B, 12DQ6, **6KG6A**, etc. **WESTGATE**, 1 (800) 213-4563. BNB6000

Cash for Collins: Buy any Collins Equipment. Leo **KJ6HI**. Tel./FAX (310) 670-6969. [radioieo@earthlink.net] BNB425

MAHLON LOOMIS, INVENTOR OF RADIO, by Thomas Appleby (copyright 1967). Second printing available from **JOHAN K.V. SVANHOLM** N3RF, SVANHOLM RESEARCH LABORATORIES, P.O. Box 81, Washington DC 20044. Please send $25.00 donation with $5.00 for S&H. BNB420

METHOD TO LEARN MORSE CODE FAST AND WITHOUT HANGUPS Johan N3RF. Send $1.00 & SASE. SVANHOLM RESEARCH LABORATORIES, P.O. Box 81, Washington DC 20044 USA. BNB421

Great New Reference Manual with over 100 pgs of P/S, transistor, radio, op-amp, antenna designs, coil winding tables, etc. See details at [www.ohio.net/~rtormet/index.htm] or send check or M.O. for $19.95 + $2.00 P&H to RMT Engineering, 6863 Buffham Rd., Seville OH 44273. BNB202

QSL CARDS. Basic Styles; Black and White and Color Picture Cards; Custom Printed. Send 2 stamps for samples and literature. RAUM'S, 8617 Orchard Rd., Coopersburg PA 18036. Phone or FAX (215) 679-7238. BNB519

WANTED: High capacity 12 volt solar panels for repeater. **[kk4ww@fairs.org]** or (540) 763-2321. BNB2630

COLLOIDAL SILVER GENERATOR! Why buy a "box of batteries" for hundreds of dollars? Current regulated, AC powered, fully assembled with #12 AWG silver electrodes, $74.50. Same, but DC powered, $54.50. Add $2.50 shipping. **Thomas Miller**, 314 South 9th Street, Richmond IN 47374. BNB342

ASTRON power supply, brand-new w/warranty, RS20M $99, RS35M $145, RS50M $209, RS70M $249, **AVT**. Call for other models. **(626)** 286-0118. BNB411

Wanted: ICOM UX-R96 and UX97 plug-in modules for an ICOM 970. Randy Ballard N5WV, (903) 687-3002. BNB175

HEATH COMPANY is selling photocopies of most Heathkit manuals. Only authorized source for copyright manuals. Phone: (616) 925-5899, 8–4 ET. BNB964

Electricity, Magnetism, Gravity, The Big Bang. New explanation of basic forces of nature in this 91-page book covering early scientific theories and exploring latest controversial conclusions on their relationship to a unified field theory. To order, send check or money order for $16.95 to: American Science Innovations, PO Box 155, Clarington OH 43915. Web site for other products [http://www.asi_2000.com]. BNB100

Wanted: ICOM IC-970. Must be in mint condition, non smoker. Also looking for the following ICOM sales brochures: IC-275, 575, 375 and 970. Randy Ballard **N5WV**, (903) 687-3002. BNB75

TELEGRAPH COLLECTOR'S PRICE GUIDE: 250 pictures/prices. $12 postpaid. **ARTIFAX BOOKS**, Box 88, Maynard MA 01754. Telegraph Museum: [http://wltp.com]. BNB113

NEVER SAY DIE

continued from page 60

I've known, that rule fits. It's like trying to find a good teacher. When it's the bottom 20% of the high school graduating classes that go to ed schools so they can get a license to join the teacher's union and never have to worry about getting fired, the likelihood of a smart teacher managing to survive the system is minuscule. It wasn't as bad 60 years ago when I went to school, yet in my 17 years of school I had exactly two good teachers — one in high school (art), and one in college (accounting).

Sigh, if I could just convince you to get as many people as you can to Never Re-elect Anyone (NRA), we'd go a long way toward solving the campaign financing mess, and we'd soon get rid of professional politicians. If we lose a few good ones along with the crooks, it's a sustainable loss.

The system is obviously not going to fix itself. The foxes are running the chicken coop, so it's up to the public to take its eyes off Jerry Springer and ball games long enough to change things.

Bush was a crummy president, but he wasn't as bad as Clinton.

The Other Shoe

Since the Kenneth Starr investigation started with Whitewater, even a not very perceptive person might wonder how come the released Starr report didn't mention this. This will, I suspect, be the other shoe to drop.

Between the leaks and White House spinmeisters, anyone can be forgiven for being confused about the Whitewater mess. Maybe I can clarify it for you.

This all started back in Arkansas where the Clintons were partners with Jim and Susan McDougal in the Whitewater Development Corporation. The accounts were kept in the Madison Guarantee Savings & Loan, run by Jim McDougal, with Hillary Clinton as an attorney. When federal bank examiners checked Madison they testified that it was a "politically corrupt institution that routed millions of dollars to politically connected Arkansans." The report cited wire fraud, illegal campaign contributions, embezzlement, money laundering, falsification of loan records and board minutes, etc. The FDIC had to cover over $60 million that was looted.

Part of the money stolen by McDougal and Hillary went to Bill Clinton's campaign account.

The reason a special prosecutor had to be called in was the obstruction of investigations at both the state and federal levels by the Clintons, the same pattern we've seen repeated with Bill's sex scandals.

PROPAGATION

Jim Gray W1XU/7
210 E Chateau Circle
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[jimpeg@netzone.com]

May 1st–3rd are expected to reveal a disturbed (D) magnetic field and upset to active ionosphere, resulting in Very Poor to Poor (VP–P) HF propagation. High signal absorption is expected on 80, 40, and 30 meters, rendering the bands essentially useless during major parts of the day.

There could be band "wipe-outs" on 20 meters and higher during the next few days, with only weak and watery-sounding signals on polar paths. Gradual improvement should be noted on the 4th and 5th, with good (G) propagation conditions returning on the 7th, and lasting for about a week.

Thereafter, propagation will be only fair until the 16th and 17th, when the ionosphere will become upset once again, and poor conditions prevail. A slight recovery should last for a day or two. Poor and upset conditions are likely to return between the 21st and the 24th. Only gradual improvement will take place until the 29th, when Poor to Very Poor propagation is expected to return and continue through the end of the month.

Use the calendar to plan your *best* HF operating days (4th–15th, 19th, and 25th–28th). Look at 6 and 2 meters for good VHF-DX openings on May 1st, 22nd, 30th and 31st.

Band-by-band Forecast for May

10–12 Meters

Expect morning F2 path openings to Europe and Africa on G days, midday path openings to South and Central America, and F2 path openings to Japan, Australasia, and the Pacific during the afternoon at your location. DX moves west as the day progresses.

15–17 Meters

Expect good DX paths to most areas of the world, with excellent openings from the northern hemisphere to Africa, South America, and the Pacific during hours of daylight and peaking during local afternoon. Good short-skip communication over 1,000 miles will occur on G days.

20 Meters

Very good DX openings to all areas of the world from sunrise through the early darkness hours. The signals will peak an hour or two after sunrise at your location, and again during the afternoon. Short skip beyond about 700 miles will occur during daytime hours.

30–40 Meters

Good worldwide DX openings from sunset to sunrise should occur on G days. Noise levels (static) will be higher as spring thunderstorms occur, and can depress audibility. Short skip between 100 and 1,000 miles will occur during daylight hours, and distances beyond 1,000 miles at night.

80–160 Meters

On 80, DX to the southern hemisphere and also to Europe should occur after dark and during sunrise hours—limited, of course, by static noise levels. Daytime short skip to about 350 miles, and beyond 500 miles after dark, will prevail on G days. On 160, no daytime propagation will occur due to ionospheric absorption of signals, but after dark and peaking around midnight, and again during the pre-dawn hours, you should be able to "work" many areas of the world. Short skip from 1,000–2,000 miles or so will prevail during the nighttime hours ... *but*, as always, it will be limited by high static levels from thunderstorm activity. W1XU/7.

May 1999

SUN	MON	TUE	WED	THU	FRI	SAT
						1 VP-P/D
2 P/D	3 P-F	4 F	5 F	6 F-G	7 G	8 G
9 G	10 G	11 G-F	12 F	13 F-G	14 G-F	15 F
16 F-P	17 P	18 P-F	19 F	20 F-P	21 P/D	22 P
23 P	24 P-F	25 F-P	26 P-F	27 F	28 F	29 F-P
30 P/D	31 VP/D					

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	15/17											15/17
ARGENTINA	20	20	30/40							10/12	10/12	15/17
AUSTRALIA	15/17				30/40	30/40	20	20			20	15/17
CANAL ZONE	20	30/40	30/40				20	20		10/12	10/12	20
ENGLAND	20		30/40	30/40				10/12	15/17	15/17	20	20
HAWAII	15/17			80	30/40	30/40	30/40				10/12	15/17
INDIA												
JAPAN	20						20	20	15/17	15/17	15/17	20
MEXICO	20/30	30/40	30/40				20	20		15/17	15/17	30/40
PHILIPPINES							17/20	17/20				
PUERTO RICO	30/40	40/80	40/80	40/80	40/80	40/80		17/20	10/12	10/12	15/17	15/17
RUSSIA (C.I.S.)	30/40						20/30	17/20	17/20			
SOUTH AFRICA			20/30					10/12	10/12	17/20	17/20	30/40
WEST COAST												

CENTRAL UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14/20	17/20	17/20		30/40	30/40				17/20	15/17	15/17
ARGENTINA	17/20	30/40									10/12	15/17
AUSTRALIA					30/40	10/12	17/20	17/20				15/17
CANAL ZONE	20	30		30/40	30/40			17/20	10/12	10/12	15/17	17/20
ENGLAND			40/80		30/40	30/40			15/17	17/20	20	
HAWAII	15/17	20/30			40/80	40/80	40/80	20/30			10/12	12/15
INDIA								20/30	17/20			
JAPAN	15/17	17/20				20/40	40/80	17/20				15/17
MEXICO	20	30		30/40	30/40			17/20	10/12	17/20	20	
PHILIPPINES	17/20	30/40					17/20	20/30				15/17
PUERTO RICO	20	30		30/40	30/40			17/20	10/12	15/17	20	
RUSSIA (C.I.S.)			30/40						15/17	17/20	20	
SOUTH AFRICA	17/20								10/12	17/20		17/20

WESTERN UNITED STATES TO:

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ALASKA	15/17	15/17	17/20			30/40	30/40					
ARGENTINA	10/12	15/17	20	30				30			15/17	10/12
AUSTRALIA	15/17	17/20					30/40					10/12
CANAL ZONE	17/20	20/30	20/30	30/40	30/40	80			15/17	10/12	10/12	17/20
ENGLAND				30/40	40/80				15/17	15/17	17/20	20
HAWAII	15/17	20/30						20/30	20/30		10/12	10/12
INDIA	17/20	20							17/20			
JAPAN	15/17	15/17	17/20			30/40	30/40					
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PHILIPPINES	15/17	17/20	20	20		30/40			17/20	17/20		
PUERTO RICO	17/20	20/30	20/30	30/40	30/40	80			15/17	10/12	10/12	17/20
RUSSIA (C.I.S.)				30/40				20	15/17	20	17/20	
SOUTH AFRICA	20								17/20	15/17	17/20	20
EAST COAST												

Here are some of the books Wayne has written. Some can change your life, if you'll let them. If the idea of being healthy, wealthy and wise is of interest to you, start reading. Yes, you can be all that, but only when you know the secrets which Wayne has spent a lifetime uncovering.

Radio Bookshop

The Secret Guide to Health: Yes, there really is a secret to regaining your health and adding 30 to 60 years of healthy living to your life. The answer is simple, but it means making some very difficult changes. Will you be skiing the slopes of Aspen with me when you're 90 or doddering around a nursing home? Or pushing up daisies? No, I'm not selling any health products. $5 (H)

The Secret Guide to Wealth: Just as with health, you'll find that you have been brainwashed by "the system" into a pattern of life that will keep you from ever making much money and having the freedom to travel and do what you want. I explain how anyone can get a dream job with no college, no résumé, and even without any experience. I explain how you can get someone to happily pay you to learn what you need to know to start your own business. $5 (M)

The Secret Guide to Wisdom: This is a review of around a hundred books that will help you change your life. No, I don't sell these books. They're on a wide range of subjects and will help to make you a very interesting person. Wait'll you see some of the gems you've missed reading. $5 (B)

Cold Fusion Overview: This is both a brief history of cold fusion, which I predict will be one of the largest industries in the world in the 21st century, plus a simple explanation of how and why it works. This new field is going to generate a whole new bunch of billionaires, just as the personal computer industry did. $5 (C)

The Bioelectrifier Handbook: This explains how to build or buy a little electrical gadget that can help clean the blood of any virus, microbe, parasite, fungus or yeast. The process was discovered by scientists at the Albert Einstein College of Medicine, patented, and then hushed up. It's curing AIDS, hepatitis C, and a bunch of other serious illnesses. The circuit can be built for under $20 from the instructions in the book. $10 (A)

Moondoggle: After reading René's book, *NASA Mooned America*, I read everything I could find on our Moon landings. I watched the videos, looked carefully at the photos, read the astronaughts' biographies, and talked with some of my readers who worked for NASA. This book cites 25 good reasons I believe the whole Apollo program had to have been faked. $5 (D)

Mankind's Extinction Predictions: If any one of the experts who have written books predicting a soon-to-come catastrophe which will virtually wipe us all out are right, we're in trouble. In this book I explain about the various disaster scenarios, from Nostradamus, who says the poles will soon shift, wiping out 97% of mankind, to Sai Baba, who has recently warned his followers to get out of Japan and Australia before March6th this year. The worst part of these predictions is the accuracy record of some of the experts. Will it be a pole shift, a new ice age, a massive solar flare, a comet or asteroid, or even Y2K? I'm getting ready, how about you? $5 (E)

Wayne's Submarine Adventures in WWII: Yes, I spent from 1943-1945 on a submarine, right in the middle of the war with Japan. We almost got sunk several times, and twice I was in the right place at the right time to save the boat. What's it really like to be depth charged? And what's the daily life aboard a submarine like? There are some very funny stories. If you're near Mobile, please visit the Drum. $5 (S)

Improving State Government: Here are 24 ways that almost any state government can cut expenses enormously, while providing far better services. I explain how any government bureau or department can be gotten to cut its expenses by at least 50% in three years and do it cooperatively and enthusiastically. I explain how, by applying a new technology, the state can make it possible to provide all needed services without having to levy *any* taxes at all! Read the book, run for your legislature, and let's get busy making this country work like its founders wanted it to. Don't leave this for "someone else" to do. $5 (L)

Travel Diaries: You can travel amazingly inexpensively – once you know the ropes.Enjoy Sherry and my budget visits to Europe, Russia, and a bunch of other interesting places. How about a first class flight to Munich, a rented Audi, driving to visit Vienna, Krakow in Poland (and the famous salt mines), Prague, back to Munich, and the first class flight home for two, all for under $1,000. Yes, when you know how you can travel inexpensively, and still stay in first class hotels. $5 (T)

Wayne's Caribbean Adventures: More budget travel stories – where I visit the hams and scuba dive most of the islands of the Caribbean. Like the special Liat fare which allowed us to visit 11 countries in 21 days, with me diving all but one of the islands, Guadeloupe, where the hams kept me so busy with parties I didn't have time to dive. $5 (U)

Silver Wire: With two 3" pieces of heavy pure silver wire + three 9V batteries you can make a thousand dollars worth of silver colloid. What do you do with it? It does what the antibiotics do, but germs can't adapt to it. Use it to get rid of germs on food, for skin fungus, warts, and even to drink, Read some books on the uses of silver colloid, it's like magic. $15 (Y)

Classical Music Guide: A list of 100 CDs which will provide you with an outstanding collection of the finest classical music ever written. This is what you need to help you reduce stress. Classical music also raises youngsters' IQs, helps plants grow faster, and will make you healthier. Just wait'll you hear some of Gotschalk's fabulous music! $5 (Z)

Reprints of My Editorials from *73*.

Grist I: 50 of my best non-ham oriented editorials from before 1997. $5 (F)

Grist II: 50 more choice non-ham editorials from before 1997. $5 (G)

1997 Editorials: 240 pages. 216 editorials discussing health, ideas for new businesses, exciting new books I've discovered, ways to cure our country's more serious problems, flight 800, the Oklahoma City bombing, more Moon madness, and so on. In three $5 volumes. $15 (O)

1999 Jan-Aug Editorials: 188 pages in two $5 volumes. Bringing you up to date. $10 (P)

Ham-to-Ham: 45 of my ham-oriented editorials. These will help you bone up on ham history. Great stuff for ham club newsletter filler. Yes, of course these are controversial. $5 (Q)

$1 Million Sales Video: How to generate extra million in sales using PR. This will be one of the best investments your business ever made. $43 (V)

One Hour CW: Using this sneaky method even *you* can learn the Morse Code in one hour and pass that dumb 5wpm Tech-Plus ham test. $5. (CW)

Code Tape (T5): This tape will teach you the letters, numbers and punctuation you need to know if you are going on to learn the code at 13 wpm or 20 wpm. $5 (T5)

Code Tape (T13): Once you know the code for the letters (T5) you can go immediately to copying 13 wpm code (using my system). This should only take two or three days. $5 (T13)

Code Tape (T20): Start right out at 20 wpm and master it in a weekend for your Extra Class license. $5 (T20)

Code Tape (T25): Same deal. It doesn't take any longer to handle 25 wpm as it does 13. Or use the ARRL system & take six months.$5 (T25)

Wayne Talks at Dayton: This is a 90-minute tape of the talk I'd have given at the Dayton, if invited. $5 (W1)

Wayne Talks at Tampa: This is the talk I gave at the Tampa Global Sciences conference. I cover cold fusion, amateur radio, health, books you should read, and so on. $5 (W2)

Stuff I didn't write, but you need:

NASA Mooned America: René makes an air-tight case that NASA faked the Moon landings. This book will convince even you. $25 (R1)

Last Skeptic of Science: This is René's book where he debunks a bunch of accepted scientific beliefs – such as the ice ages, the Earth being a magnet, the Moon causing the tides, and etc. $25 (R2)

Elemental Energy Subscription: I predict this is going to be the largest industry in the world in about 20-30 years. They laughed at me when I predicted the personal computer growth in 1975. PCs are now the third largest industry in the world. The elemental energy ground floor is still wide open, but then that might mean giving up watching ball games and talk shows on the boob tube. $30 for six issues. (EE). A sample issue is $10.

Three Gatto Talks: A prize-winning teacher explains what's wrong with American schools and why our kids are not being educated. Why are Swedish youngsters, who start school at 7 years of age, leaving our kids in the dust? Our kids are intentionally being dumbed down by our school system — the least effective and most expensive in the world. $5 (K)

......*Wayne*

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Oops! — page 33

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JUNE 1999
ISSUE #464

73® Amateur Radio Today

TABLE OF CONTENTS

FEATURES

DEPARTMENTS

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— see page 56

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On the cover: How'd you like this in your yard? Article begins on page 35. We are always looking for interesting articles and cover photos — with or without each other. Your name could be in this space *next* month, and our check could be on its way to *you!* You couldn't use a little extra cash?

Feedback: Any circuit works better with feedback, so please take the time to report on how much you like, hate, or don't care one way or the other about the articles and columns in this issue. G = great!, O = okay, and U = ugh. The G's and O's will be continued. Enough U's and it's Silent Keysville. Hey, this is *your* communications medium, so don't just sit there scratching your...er...head. FYI: Feedback "number" is usually the page number on which the article or column starts.

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Number 1 on your Feedback card

NEVER SAY DIE

Wayne Green W2NSD/1

Kids Killing Kids

Of course we blame the kids. And their parents. We blame the arcade and home video killer games. We blame TV and the movies. We blame comic books. And we try to stop it with laws and metal detectors, making going to school like going through an airport security gate. Every day, several times a day.

So what's going on? And are there any answers as to how to prevent these tragedies? Of course, or I wouldn't have brought it up.

Actually, I've written about these things before, but you weren't paying enough attention.

First, remember what I've explained about what rock music does to plants as compared to classical music? Rock stunts and dwarfs them. And do you remember about the tests with mice where the test had to be stopped after a couple weeks because those exposed to rock were killing each other? I'm not even talking about the lyrics in some rock and rap music, which glorify brutality.

Then there arc the mood-altering effects of aspartame (NutraSweet), which make some people fat and others very depressed.

I've reviewed Dr. Rapp's book, *The Impossible Child*, which explains how allergies can trigger all kinds of terrible behavior, depression, attention deficit disorder, and hyperactivity.

I've also written a lot about the damage and mood-altering effects of fluorides in our drinking water.

Then there's sugar. Have you read Nancy Appleton's *Lick The Sugar Habit* yet? Sugar, too can be mood altering. Maybe you remember the "Twinkie Defense" used in the murder of the San Francisco mayor. "Sugar made me do it."

It's easy to blame guns or videos, but there can be many contributing factors, so savvy parents will do their best to keep their children away from as many of the bad influences as they can. Children can learn to love good music even before they are born. Read *The Prenatal Classroom*, which I have reviewed for you.

My mother read to me from the earliest days I can remember, so I've always enjoyed reading.

Then there's my review of the Lieberman book on light and the research showing how much improved kids' grades are and how they get along so much better with each other when there are full spectrum lights in their classrooms.

Copper can cause psychotic behavior. Most schools have water softening systems which leach copper from the water pipes for the kids to drink.

Another problem for kids has been the side effects of immunization shots. There are several exposés of this medical scam, but the best is the one by Dr. Walene James, which I've reviewed for you.

I haven't done a report on the damage our American milk supply is doing, but I will. Between many people being allergic to cow's milk, plus the antibiotics and growth hormones it now contains, this is significantly adding to children's behavior problems.

Kids need every break they can get, not medication like Ritalin to control their behavior. They're sent to school after a breakfast of sugar-coated frosties with rBST-laced milk, plus some white toast and jam. Animals fed some of our popular breakfast cereals die of starvation.

Sugar

It's frustrating. I can't get you to stop eating sugar. I can't even get you to stop feeding it to your kids. I can't get you to read books about sugar, like Nancy Appleton's *Lick The Sugar Habit* ($6), or Duffy's *Sugar Blues* ($6). They've reprinted a book I've been looking for by Dr. Weston Price, one of the pioneer researchers in the sugar vs. health field — *Nutrition and Physical Degeneration.* The data is 60 years old and as relevant now as then. Sugar is a poison.

Did you know that on the average we are eating more sugar in a week than our ancestors a couple hundred years ago did in a year? And it's doing a job on us. Sugar is as addictive, and as poisonous, as nicotine.

Tests with school children have shown that a can of soda pop (10 teaspoons of sugar) results in behavior problems. Schools that have eliminated sugar from their lunches have produced remarkable gains in grades, with much less fighting and destructiveness.

Our Schools Suck

Okay, okay, I've been harping on this for a long time — so what have you, personally, done to help change things? Did you take your eyes off the sports pages long enough to read about the recent international tests where American kids placed just about dead last in math and science? And we used to be at the top. Or about the tests Massachusetts gave their prospective teachers? Almost 60% failed the admittedly very elementary test!

I won't bore you with the statistics, but they are appalling.

The top scoring countries in math are, as you might expect, the Asian tigers — Singapore, Korea, Japan, and Hong Kong. The Czech Republic placed third in science.

We have a long way to go if we want to fix the problem. Under the "leadership" of the NEA union our ed schools are awful. I tried to get you to read about them when I reviewed Rita Kramer's book, *Ed School Follies*. See page 8 of my *Secret Guide to Wisdom.* Thomas Sowell exposes the mess in his *Inside American Education*. You undoubtedly saved $10 by not sending for *Dumbing Us Down* by John Gatto. I've reprinted three fascinating talks by Gatto which are available via the Radio Bookshop for $5. I've been getting wonderful letters from parents thanking me for making these reprints available.

I'd like to see the NEA towed out to sea and dumped, along with the other garbage. I'd like to see our schools operating 50 weeks of the year, with youngsters allowed to take the subjects that interest them when they want. I'd like to see the responsibility for learning put on the students and their parents, but with our schools making the courses available. No tests. No grades. Learn what you want, when you want. I'd like to see courses advertised and promoted like any other product, and the students convinced to take them on the basis of the

Continued on page 57

Number 6 on your Feedback card

LETTERS

From the Ham Shack

Hank Landsberg WB6MEU, Sierra Madre CA. Regarding the news item that appeared on page 6 of your February issue, please be advised that the information in this item, as it relates to me, is incorrect and outdated. Contrary to the article: (1) I was NOT arrested; (2) I was NOT cited; and (3) even according to an FCC spokesperson, my amateur license was NOT "in jeopardy." This matter has been resolved, and my Advanced Class ticket is intact.

Our apologies to Hank. As we noted at the time, the item in question originally appeared in The ARRL Letter. *— ed.*

Dean E. Hale KF7CR, Eugene OR. On a return trip from India, I transited through San Francisco airport. In the North Terminal Connector Gallery (mostly United flights), there is a display (called "On the Air") of radios from the '20s through '60s. There is also a display of microphones and some examples of broadcast band receivers of notable aesthetic design or function. It is a great place to spend an hour or two. Actually, I was frustrated that I had a layover insufficient to see everything.

I ran into a retired nun who saw one of the old radios from the '40s. She confessed to me that when she was a child, she used the light from the back of a tube radio to read by after it was time for lights out.

The exhibit runs through July 1999. It's well worth the visit!

Thanks for taking the time to share, Dean ... — ed.

Jules E. Blitz W3YZE, Baltimore MD. I really enjoyed Bob Shrader's article on "Keys to Good Code" (March). May I add my two cents?

As a regimental radio operator in the infantry in Europe in WWII, and eventually radio chief, I spent many hundreds of hours at the code table in Camp Wheeler, Georgia, and then at an advanced radio and code course at Fort Benning. We were taught that the sending was really done with the wrist (as the article clearly points out) and we had to practice holding the key knob in our right hand and pushing the wrist with the left so we would get the feel of it. Strangely enough, it can be done. Eventually, I passed 20 words per minute and I still proudly have my certificate to prove it. But the next step, 25 WPM, eluded me. I could copy behind as you had to do, but the army insisted that every letter be printed the GI way, and I never could get my printing fast enough for 25.

There were two sets of rhythm practice (having nothing to do with birth control — the saltpeter in the coffee took care of that). We would send BENNING and B7FG4. It helped to get the rhythm of code down, almost like music.

The idea behind the sending was for everyone to have the same fist so the Germans wouldn't be able to tell which unit was sending. Of course, in very little time we always knew who was on the key at the other end, be it the drag on the dah on Roger or six dits when all he needed was five.

And then, after all that wonderful code table practice and using the wrist to send, when we got into the field in combat conditions, guess what? Right. We used a leg key clamped onto the thigh and never did anything more than slap it to send messages. Try sitting in a crowded jeep and sending with your wrist using a leg key ... forget it.

I have been a ham now for 45 years and still enjoy CW. It's like having a second language and being able to communicate with those special people who also know this fast disappearing language. Interestingly enough, most of the punctuation remains the same. Our question mark was INT and his end of QSO as SK was always VA to us, which comes out of the same end of the horn.

So to all and any potential CW ops out there, re-read that article. It is full of good practical advice. DIT DAH DIT DAH DIT — DAH DIT DAH ...

Alan Glasser NY2G, Brooklyn NY. The consumer magazines' advertisement headlines read, and the television shopping shows say, "You can talk in the mall, on the slope, on the trail, and across the park." "Family and friends stay together even when they're apart." "Talk from car to car." "While riding your bike." "No cell phone fees." "Free!" "Up to 2 miles' range." "14 channels and 38 privacy codes." "Reach out and touch someone."

If you haven't figured it out yet, I am quoting from advertisements touting the benefits of the small hand-held two-way radios that are used in the Family Radio Service (FRS). The Family Radio Service is a license-free, short range, low power, two-way radio service that was established by the FCC back in 1996 specifically for family and individual recreational use. These radios operate on a 14-channel frequency range from Channel 1 being 462.5625 MHz to Channel 14 being 467.7125 MHz (specifications from my Motorola Talkabout).

Most of the radios have "Interference Eliminator Codes," Continuous Tone-Coded Squelch System (CTCSS as we hams know it), or Private Line (PL™ as Motorola might have you know it).

Many of the radios have advanced features such as hands-free VOX, headsets, recharging accessories, and carrying accessories. Enough to make me jealous of what's available for my HTs.

I know you've seen them. I have seen them in the malls, and while skiing and hiking. I've even seen a family outfitted using a yellow set of them while I was standing on line at Kennedy Airport. *(And many families don't go to Disney without them ... — ed.)*

I've been a ham since 1984. My first HT was an ICOM IC-02AT. I've had a few other HTs since then. But you know what? I went out and purchased a set of these FRS radios for use with my friends when hiking or traveling in separate cars. I take them to the mall. I use them when I bike with a friend.

Let me make something perfectly clear: I always have a dual-band HT with me. But, since my companions may not be hams, I keep a set of FRS radios in the trunk of my car. They are convenient, cost-effective, rugged, work well, and meet the need. They work "up to 2 miles" on a good day.

So what are we missing here?

The public (non-ham community) has become radio-active. They are buying and using these things! They are getting used to pressing a Push-To-Talk button and communicating with someone else. On an HT! On UHF! Using CTCSS! With about the same power many ham HTs put out!

But they can only talk up to 2 miles on a good day! The FRS does not allow the use of auxiliary antennas (the units' antennas are fixed), or the use of repeaters.

What kind of excitement do you think could be generated if the public were educated to the fact that instead of being limited to 2 miles, they could communicate 20,000,000+ miles?

Now, before I get a zillion letters questioning how a UHF HT can communicate twenty million miles, I did a very quick estimation of all the listed re-

Continued on page 62

QRX . . .

Number 8 on your Feedback card

Ham Radio Numbers Declining

The numbers for 1998 are in, the trend is downward and the outlook is not very good for lhe future of amateur radio. This is the gist of recently released FCC figures on the number of amateur radio operators licensed by the agency, and if the figures hold, 1998 will have been the first year of actual decline in the total number of United States radio amateurs in the past two decades.

A year ago, there was a total of 719,331 licensed radio amateurs listed in the FCC's database. Twelve months later, that figure has dropped to 718,241. That's a drop of 1090 hams, or a 0.2% annual rate of attrition, and while it might not seem very significant, 1090 is more hams lost in the United States than are licensed in some other nations.

Looking at the percentage rates gives even more reason for alarm. Since 1992, when the annual growth rate was a healthy 8.4% a year, the trend has been steadily downward. In 1993, it had dropped to 7.3%. By 1994, to 6.7%. 1996 had the most dramatic drop, to a minuscule 0.8% growth, and now, in 1999, we are into negative numbers.

And negative numbers mean that the ham radio bands are more vulnerable to attack from the corporate raiders in the telecommunications industry. These are people who envision millions of dollars of profit by evicting hams from the bands above 50 MHz, and having that valuable spectrum reallocated to their use.

It also means that the government itself might begin to think in terms of the millions or billions of dollars that it might garner by auctioning off some of our bands. Finally, on another level it means that there will be less interest by companies in introducing new equipment. As any manufacturer will tell you, it makes no sense to put money into research for new products for a market that may soon die off.

Thnx to *W5YI Report*, reprinted in *The Cherry Juice*, newsletter of the Cherryland (Traverse City MI) ARC, February 1999.

ARRL License Restructure Reply Filed

The ARRL has suggested that its plan to restructure amateur radio licensing represents the best compromise among the many that have been brought forth. In reply comments filed January 15 with the FCC, the League held firm to its restructuring proposals that would reduce the number of license classes from six to four by eliminating the Novice and Tech Plus tickets; provide 5 WPM and 12 WPM Morse code testing tiers; and permit Technician operators to use Morse code on the current General Class CW bands.

The League's plan would also refarm the Novice/Tech Plus CW allocations among the remaining license classes and revise both written and Morse exam requirements to make them more relevant and more comprehensive. In general the League's reply comments reiterated its initial comments filed last December 1.

The ARRL said four license classes provided a manageable gap between license classes to encourage upgrading. "Looking at the matter this way, four license classes is a good plan, and three license classes is not," the League said. Under its plan, Novice and Tech Plus licensees would be automatically upgraded to General.

The League found an ally in CQ Communications comments on refarming the Novice/Tech Plus CW allocations among the remaining classes for additional phone bands. *CQ* called it "the correct approach."

Thnx to the ARRL Letter, courtesy of Peoria Area ARC's March 1999 *Bandbits*.

FCC Mission?

A top federal legislator has called for the FCC to get out of the regulatory business and to concentrate on making money for the federal government.

Louisiana Republican Billy Tauzin says that the FCC needs to be revamped to have a competitive rather than regulatory mission. Tauzin is the chairman of the House Committee on Telecommunications. On Friday, March 12th, he told reporters that he hopes to have a bill drafted by this month detailing the changes in the FCC's mission and structure that Congress would like to see implemented.

Tauzin says that he doesn't have many specifics and is open to suggestions. He and other Republicans in Congress have criticized the FCC for acting too regulatorily. This is particularly true in areas such as the implementation of a 1996 law freeing cable, local and long-distance companies to get into each other's business.

Meanwhile, FCC Chairman Bill Kennard says that he is very interested in working with congressional lawmakers to help the agency run effectively into the 21st century. Kennard says that he will present an upcoming congressional telecommunications hearing with a blueprint for restructuring the agency that would be open to public comment. He says that by the fall he would like to have a final plan In place.

What impact such a restructuring might have on amateur radio is hard to say, but it would definitely make any spectrum above 50 MHz—and possibly some in the shortwave region—more vulnerable to reallocation and auction. This may well be the main reason that the ARRL is pressing so hard for the passage of its Amateur Radio Spectrum Protection Act. This, as a way of ensuring that hams have a place to operate no matter what happens to the mission and the structure of the FCC.

FCC Chairman Kennard prefers a two-tiered approach to restructuring the Commission. He says that part of the plan could be implemented by the FCC itself, but requires congressional action first. It's not clear that any measure to overhaul the FCC could pass Congress and be signed into law.

Meanwhile, Kennard has taken on another challenge, that of convincing the public that his agency is not about to begin regulating the Internet.

The Federal Communications Commission was bombarded with E-mail from computer users fearing government regulation. On Thursday, March 11th, Kennard tried to dispel that notion, stating that as long as he is chairman, the Federal Communications Commission will not regulate the Internet.

The FCC last month concluded that dial-up calls to the Internet are interstate communications and are subject to federal jurisdiction. Internet dial-up connections are now treated as local calls. The FCC has said this decision merely resolves a dispute among phone companies over how to compensate each other for Internet connections and how to clarify the role of state and federal regulators. The agency said the decision will not affect connectors to the Internet or how much they are charged for the call.

Consumer groups and others believe that the action could lead to higher Internet access charges in the future, but Kennard says that the FCC has no intention of making computer users pay long-distance fees for dial-up access.

Thnx to the FCC and to *Newsline*, Bill Pasternak WA6ITF, editor.

New Technology for the Amateur Bands

Many amateurs are concerned about the future of our hobby. I think that lack of interest on the part of persons who would otherwise become licensed is the basis of this concern. Two major reasons for this uninterest, in my opinion, are the lack of time and energy. Together with the stigma of ancient technology, these provide a sufficiently high-energy barrier to the learning of code.

The Internet, perceived as a modem technology, provides a means to satisfy the urge to communicate and makes it easy to reach across the globe.

I feel that new technology is required to attract more people to our hobby. A new, digital,

Continued on page 38

Regens for the Millennium

Part 1: A new look at an old friend.

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They come and go, these strange little devices. Every few years sees a resurgence of interest in a simple concept known as the regenerative receiver. If you have ever played with one you know they produce a unique kind of fun. If you have never done so, you are in for a treat. In this first of a two-part series, we'll look at the construction side of these receivers, where to obtain parts, how to build them, and how to make improvements. Next time, we'll dig a little deeper into the frequency selection side of things and examine custom-built coils for extended spectrum coverage.

The regenerative receiver is perhaps the easiest path to amateur and shortwave radio reception short of a crystal set or TRF receiver, the only less-complicated devices known. Regens are very easy to build and require no alignment. When you finish construction, you power them up and they work—nicely. They do take some getting used to, though. Typically, they perform at their peak for some four or five hours after sunset. Daytime reception is nearly impossible. And tuning one requires a fine balance of several controls, which takes some operating experience to develop. Once set, a regen will provide many hours of simple enjoyment.

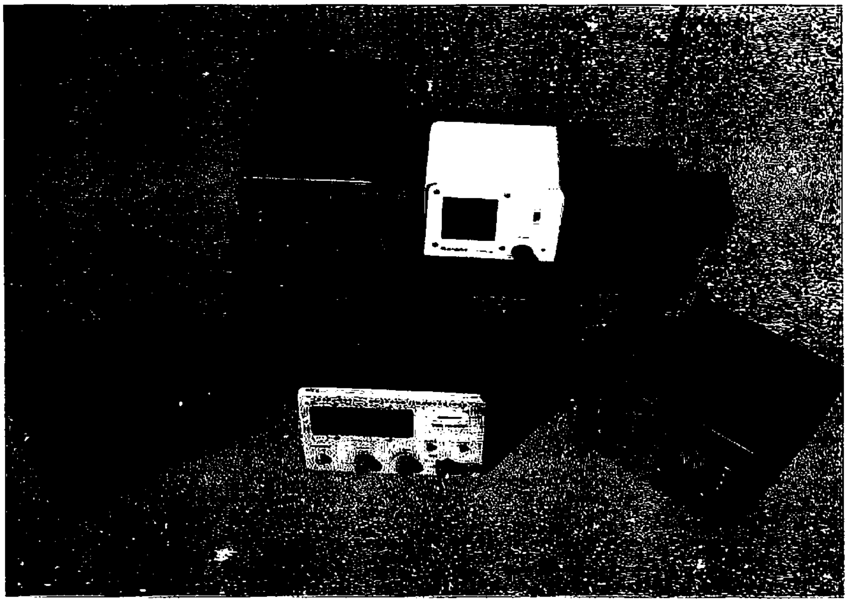

Photo A. These boat anchors will be your flea-market source for parts such as those in Photo B.

During the past 60 years, thousands of hams and SWLs have gotten their start with one of these units. By the early 1960s, the circuit had gone through an evolution that culminated in such classic commercial rigs as Allied Radio's "Ocean Hopper," "Space Spanner," and "Span Master," each successively a bit more sophisticated. Companies such as Lafayette Radio offered their competitive "Explore-Aire," as did many other copy-cat firms. Today, these units are scarce, but work-alike units can be easily replicated, even to the point of improvements the original designers never considered. Designs from previous decades were covered in an excellent

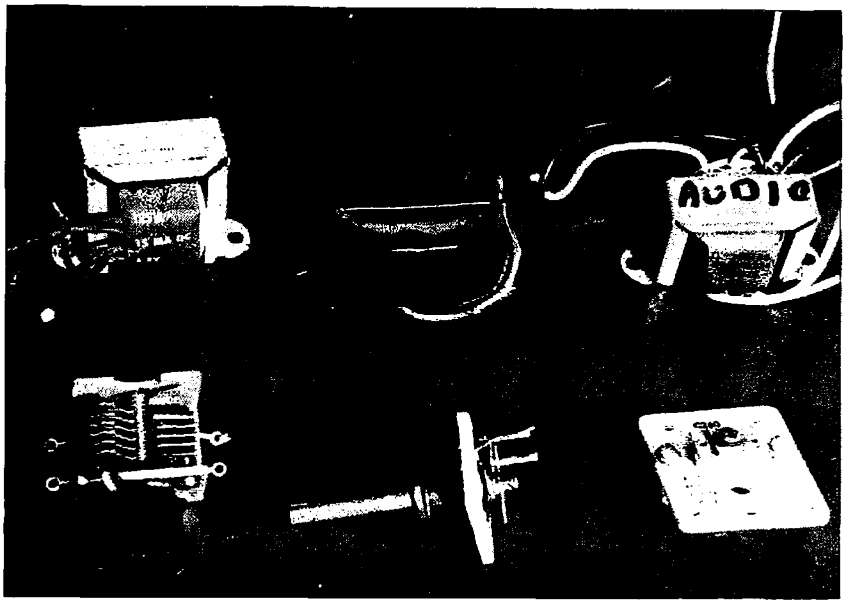

Photo B. Mined from the past (clockwise from top left): power transformer, choke, audio transformer, antenna trimmer, bandspread selector, main tuner.

article printed in the Fall 1995 issue of *Communications Quarterly* magazine.

Though many solid-state versions continue to be developed, the best overall success can be found with simple tube-type circuitry. Reason: The tubes match impedances of the long-wire antenna and home-brew coils more readily than do 2N2222s or FETs. Also, tubes of the types needed are plentiful and nearly as cheap as transistors. Many of the parts required for a tube rig are sitting around just waiting for a taker, often even for free.

A little history will be helpful here. Back in the "tube days," commercial regenerative receivers were usually built as cheaply as possible. Their so-called power supplies were a joke, and very dangerous. Often, a high-impedance, 2000 Ω headphone was all they would power. No one ever dreamed of feeding them to an outboard amplifier or tape recorder, and you didn't dare ground them!

In those days, regens often consisted of two tubes: a regenerative detector (12AT6) and an audio amplifier

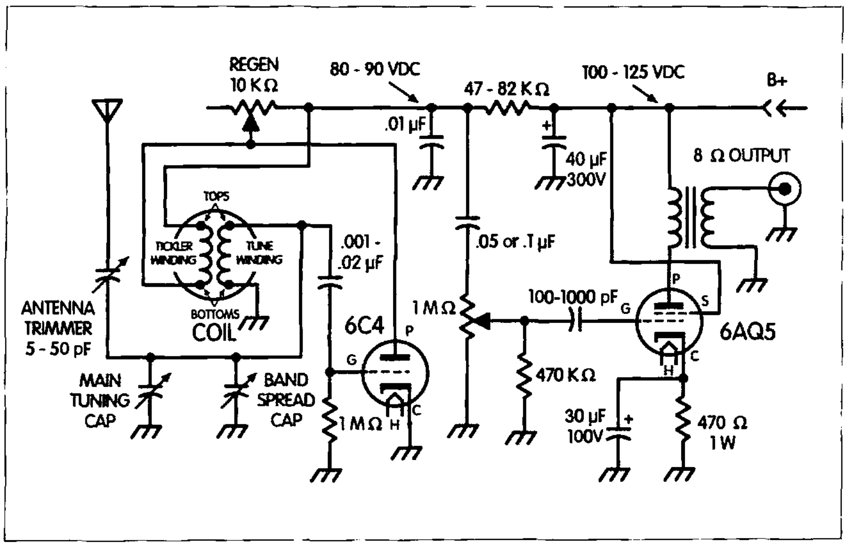

Fig. 1. Basic regenerative receiver concept.

	Cathode	Grid	Plate	Heater
6C4	7	6	5	3, 4
1/2 6AW8	1	2	3	4, 5
1/2 12AT7	3	2	1	4, 5, 9
1/2 12AT7	8	7	6	4, 5, 9
6C5 Octal*	8	5	3	2, 7
6AT6 (ground pins 5&6)	2	1	7	3, 4
*Older-style tube				

Table 1. Detector/added audio.

	Cathode	Grid	Screen	Plate	Heater
6AQ5	2	1	6	5	3, 4
1/2 6AW8	6	7	8	9	4, 5
6V6*	8	5	4	3	2, 7
*6F6, 6K6, 12A6 may also be tried					

Table 2. Audio output.

(50C5). A third "tube" was a 35W4 power rectifier, which did nothing for reception. Back then, all the tube filaments were strung together in series and powered directly by the 110 VAC house current. That same house current was rectified into the B+ DC by the 35W4. This is what made the regen dangerous to ground. The manufacturers recommended using an isolation transformer, but that was not usually done.

Today we can improve things greatly, and even though the design itself is decades old, these units still perform very well considering their low cost and simplicity. We begin by looking at hamfests, flea markets, thrift shops and garage sales for the parts we need. You won't just walk into Radio Shack™ and buy them. The good news, of course, is that you probably won't have to look very far, or pay very much.

First, try to locate an old "five-tube" table radio, which will contain most of the parts you'll need. The five tubes were as follows: 35W4, 50C5, 12AV6, 12BA6, and 12BE6. Because we are interested in upgrading the regen design, you won't be using any of the tubes, but the tube sockets, tuning capacitor, and many of the components will provide a great start toward your home-brew receiver. Other similar devices such as intercom or PA units, phono oscillators, or CB transceivers that date from about forty years ago will provide most of the audio stage components.

Our regenerative detector stage will be simplified, because in those days a few of the unused tube pins were grounded. Here we will use simple tubes that do not contain extra elements. The socket and a few salvaged resistors are all we'll require. The power supply will call for a transformer with a six-volt filament winding and a B+ winding of 125 to 250 volts. Any value is fine, although most transformers will produce about 150 volts. These can be found in old transceivers such as the Heathkit™ "Lunch Boxes," or can be taken from old unwanted test equipment such as capacitor checkers, VTVMs, or signal generators. At any given hamfest, there are tons of this stuff available, often priced at five dollars or less, usually much less. This is what you want. One of these units should also provide a suitable chassis (and cabinet) for your receiver. After sifting through four or five hamfests (at most), you should have all the parts you'll need to proceed. If not, check with other hams to see if they have any still-missing items in their junk boxes.

Since the tubes we will be using have base diagram differences, the circuit will need to be completely rewired. This means the salvaged tube sockets must be completely unsoldered. The

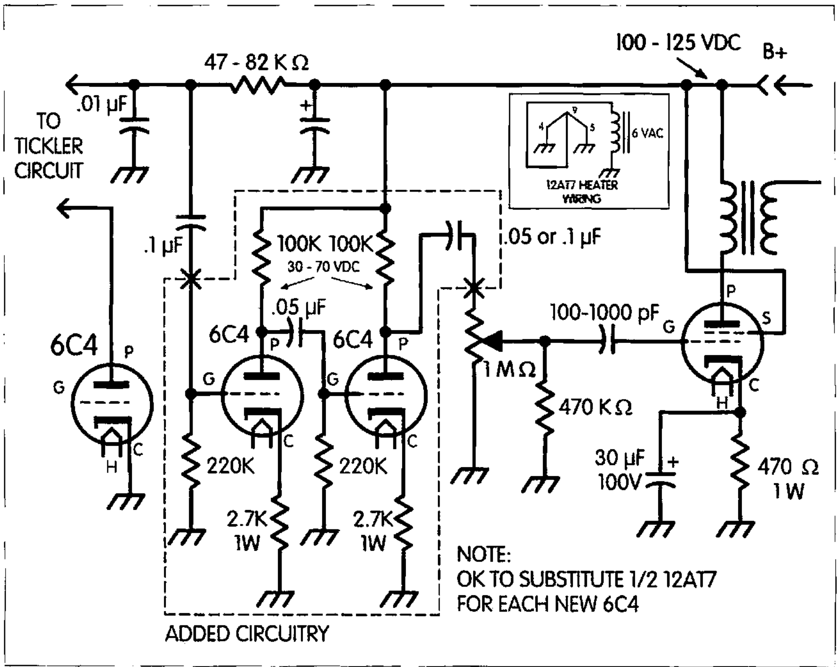

Fig. 2. Modification for more audio drive to power a speaker.

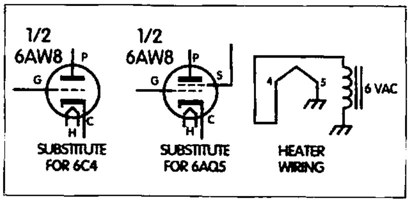

Fig. 3. Modifications needed for a single-tube version.

circuit itself, though, is very forgiving. Parts can be placed where desired and wires do not need to be short. This is a big help if using a prepunched chassis, with existing holes. It also makes it a good beginner's project, *before* you tackle that commercial transceiver kit.

Parts can be located anywhere, though the project should be divided into three separate sections: the regenerative detector stage, the audio stage, and the power supply. For the detector, start with a 6C4 tube and socket. For the audio amplifier, a 6AQ5 works very nicely. These two stages will power an 8 Ω headset quite well. Later, we'll expand the circuit to allow these same tubes to power a small 4-inch speaker (**Fig. 2**), then we'll shrink it down to a single tube for a more compact unit, QRP-style (**Fig. 3**).

The circuit shown in **Fig. 1** holds the basic design. The detector is coupled through a .05 or .1 µF capacitor to the audio stage. This junction is important, as we will be breaking it to insert more amplification later. Note that the 6C4 has three connections aside from the filaments: the cathode, the grid, and the plate. **Table 1** shows which pins on the socket to wire, as well as the filament pins which light the tube. Also given in **Table 1** is data for other tubes that work equally well, but you need to know which tube is available *before* you wire the circuit.

Table 2 gives similar data for the audio stage, and adds the required screen grid. We've already selected the 6AQ5 as our tube of choice, largely because you may have already discovered one in the chassis you salvaged for this project. If not, they are cheap and plentiful nonetheless. The power supply can be done two ways: It can be

Continued on page 14

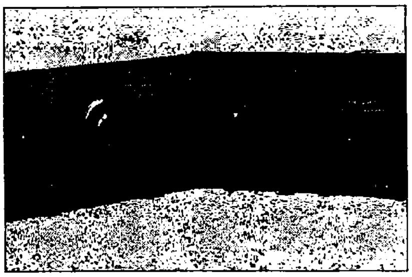

Photo C. *A real "Ocean Hopper" (left) sits beside one of the author's "replicas."*

Regens for the Millennium

continued from page 13

built onto the same chassis as the receiver, or separated into its own enclosure to power other projects (or other regens) as well.

Fig. 2 suggests a method of expanding your receiver once you have it working. Either a single 6C4 can be used to provide enough extra amplification to drive a small speaker, or two 6C4 stages can be added for even better performance. Now we can make a few new choices. A 12AT7 tube has two 6C4s inside of it. Both can be used for additional audio amplification, *or* one side can be used as the regenerative detector! This concept gives quite a bit of latitude in decision making. Since both stages are identical, one can be deleted or converted to a detector. (You can even go so far as to make interchangeable plug-in detector stages on separate plates of aluminum if you like to experiment; the audio stage and power supply remain as they were.)

Fig. 3 takes the original design (**Fig. 1**) in the other direction: Here we squeeze the entire receiver into just one tube, yet it performs exactly as well as its two-tube predecessor. For this design we use a more advanced tube, the 6AW8, which essentially combines one 6C4 and one 6AQ5 in the same glass enclosure. Oddly enough, this also gives us more choices in expanding our project. We can combine the 6AW8 with either a 6C4 or a 12AT7 for a more substantial receiver on basically the same chassis space. It is useful to note here that the 6C4 and 6AQ5 tubes use seven-pin tube sockets while the 12AT7 and 6AW8 tubes require nine-pin sockets. Available chassis space will largely be the deciding factor, as will your personal expertise. No other component changes are necessary.

Once any of the basic designs has been successfully built and operated, it is easy to continue to refine and experiment. I should mention that the resistor and capacitor values (bias) shown in the design work very well regardless of the tube complement. The

Photo D. *Here, a real "Ocean Hopper" is flanked by two workalikes (each containing built-in PS).*

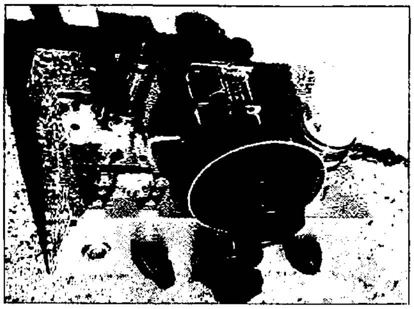

Photo E. The one-tube version is laid out in Fig. 3. No front panel, all parts on the chassis, remote PS!

reader could continue to refine the design with other values, but performance will largely remain unchanged. As I stated, the basic design is very forgiving, so anything goes.

Nor are all the refinements electrical. In expanding upon the author's original Allied Radio "Ocean Hopper" replica design, a number of cosmetic changes were attempted as well. As shown in the photographs, each successive design took on a look of its very own.

Here are some of my recommendations for parts placement:

• Locate the tuning capacitor on the top of the chassis, centered, and with the bandspread capacitor directly below if possible. Keep the coil and regenerative detector tube close to one another, to one side of the tuning capacitors.

• Locate the audio tube and audio transformer as far away as possible from the detector components. If a power supply is to be included on the same chassis, as opposed to a separate unit, divide the chassis roughly into thirds, and give each stage about the same amount of space once the tuning and bandspread capacitors are placed.

• A single-section variable capacitor can be used for main tuning—this will simplify the design. These capacitors are sometimes found in transmitters, CB sets, or test equipment. If a multi-section capacitor is used, wire only the section with the most plates.

• The antenna trimmer *must* have both sides isolated from ground, as it is in series with the antenna and the tuning circuit. Use plastic or mount on a terminal strip. Most suitable antenna capacitors require a screwdriver to adjust, as opposed to a knob. This is part of the fun of a regen!

• If plug-in coils are used, *never* change coils with the power on.

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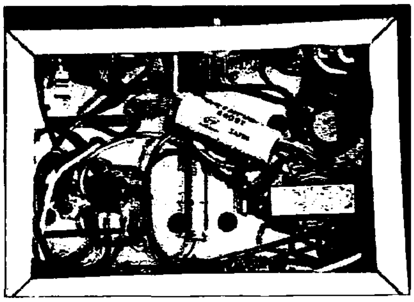

Photo F. Underside of the one-tube.

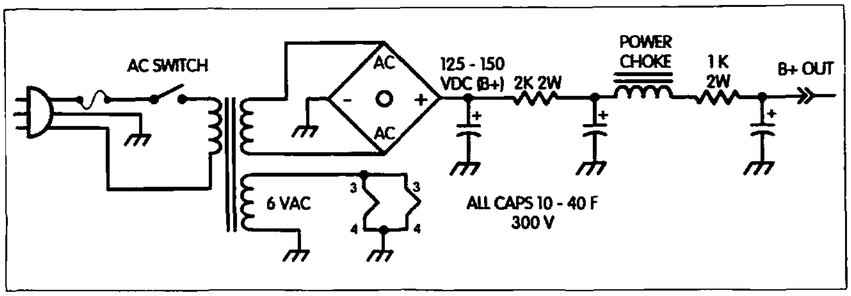

Fig. 4. Power supply circuit.

Regens for the Millennium

continued from page 15

• A front panel is optional, and all parts can be mounted on the chassis.

Operation

The tuning process is a fine balance between adjustment of the antenna trimmer, the regen pot, and the bandspread controls. The antenna trimmer is a "set and forget" affair. Adjustment is made with a small screwdriver in the versions I made. The antenna trimmer is tuned for max and only needs readjustment if you change coils or move the main tuning capacitor between opposite ends of its range. The regen control is delicate, and mastery of the regen knob only comes with practice.

Set the main tuning capacitor to a region that seems active and use the bandspread capacitor to fine-tune the signal. Once the controls are balanced, you will enjoy hours of listening. As a bonus, the circuit can even process the stronger CW and SSB signals on the amateur bands. By the way, these receivers occasionally suffer "bad days" of reception, where they seemingly do not work at all. Just a few days later, propagation changes and reception can be nearly "wall to wall" across the dial. Keep that in mind.

Reprints of manuals for the original "Ocean Hopper," "Space Spanner," and "Span Master" radios are available from Hi-Manuals, PO Box 802, Council Bluffs IA 51502. Parts are where you find them. Your first shortwave coil can be wound from #20 wire on a 1-inch or 1-1/4-inch form. Use 4 turns for the tickler winding and 9 or 10 turns for the tune winding. This will place you in approximately the 5–10 MHz portion of the shortwave spectrum. Be sure to wind both coils in the same direction—starting at the bottom of the coil, wind in a clockwise direction as you move upward, as viewed from the top of the coil.

If plug-in coil forms and a socket are available, you can experiment with winding other coils for wider coverage. Next time we will do just that. We will take an in-depth look at the secrets of successful coil-winding, not just for regenerative radios, but for nearly any other project (such as a matching QRP transmitter) you may desire. 73

Three-Element Circular Quad for 10m

For under $65!

Carl Markle K8IHQ
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Claridon OH 44024-8910

Now that ten meters is coming back again after a seven year rest, renewed interest by DX stations is again making the band exciting. Although a typical trapped 10-15-20 yagi beam is OK, an inexpensive ten-meter-only antenna is much less expensive and a real weekend do-it-yourself project.

What is being shown here is the ability of the novice, with limited technical expertise, to put together a world-class 9 dB (over a dipole) gain antenna for under $65. In today's expensive world, this is a real eye opener.

All of the components are readily available from the local hardware or home improvement store. Tools amount to the kind of tools that every home owner must have to maintain his investment—the ranch! These tools are a hack saw, screwdriver, adjustable wrench (or equivalent), and, of course, a drill with a couple of bits. If you want to make things look pretty, then maybe a crosscut file would help. Now, this project is not for the critics to bash or go into a Ph.D. thesis on—it's just common sense construction and tested results. Please, no experts need to criticize: Just go on purchasing those expensive commercial yagis.

This quad has been constructed and sized for 144 MHz and 440 MHz, and has been used for several years at this QTH. It has been modeled and plotted using several two meter repeaters in the area, a couple of which are of the 250 feet above ground and better variety. Signal strength readings were made on a Kenwood TS-780 (144 + 440 MHz) transceiver S-meter. The ten meter version was likewise plotted using a Kenwood TS-430-S transceiver S-meter using both ten meter Caribbean repeaters and European and African DX station signals. On the ten meter quad, these signal strengths (forward/back/side) were compared with an 80 meter dipole broadside in the same direction as reference. Signal strength at times was less than S-1 and unreadable; immediate switch to the ten meter quad resulted in an S-9 strength.

As for the use of circles instead of the classic square or diamond or delta shapes, there are many Ph.D.-type mathematical- and computer-derived reports of comparison with all of these shapes as well as yagi designs. The circle will always outperform these other types on weak DX conditions. That controversy will probably always go on, but my 36 years of military service as a communicator, plus the 43 years of being licensed as K8IHQ (with a huge number of operating hours on the bands), tend to give me common knowledge beyond the phony smoke and mirrors or political agenda folks. I endorse the circular quad.

If contemplation of extending the number of elements beyond four is rolling around in your mind, experience has taught me that real gain is just not there unless yagi elements are used beyond the four circular elements. One of the side effects of this will be higher noise levels, corona discharge (wind effects), and lowering the usable bandwidth, which is especially important on ten meters (also 2m–70cm). For those who wish to construct one of

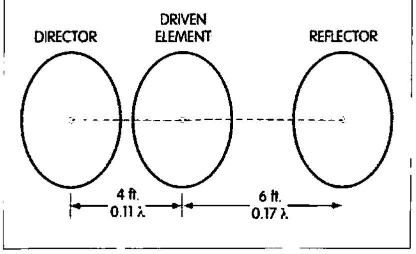

Fig. 1. Spacing diagram for the circular quad.

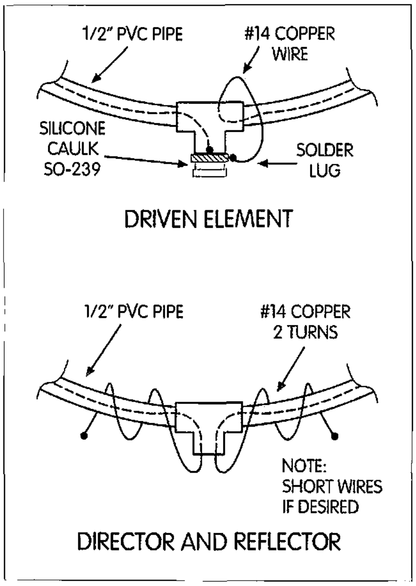

Fig. 2. Tee connections for the driven and parasitic elements.

these for two meters, it might be noted that it will be three wavelengths on 70cm—therefore you get additional gain on 70cm along with the large bandwidth gains.

The objective of this article is to provide detailed instruction on how to purchase components locally, cash-and-carry style, and put together an inexpensive high gain antenna system that does not require tuning, expensive meters, and gadgets to make it work.

Your coax length should be an odd multiple of one-half wavelengths at the lowest frequency you expect to operate. Make sure you include the VF (velocity factor) when figuring this length. Approximately 18 feet is one-half wavelength on 28.4 MHz. Now multiply the VF with this length to get the electrical (not physical) half wavelength at this frequency. Cables such as RG-213, RG-8, RG-58, etc., which have a solid poly internal covering (i.e., between the center conductor and shielded braid), have a VF of about 67%. The other types that have a foam insulation generally have a VF of about 79%. Whether you use 52 ohm or 75 ohm impedance types makes very little difference. In fact, a 75 ohm characteristic impedance more closely matches the circular loop impedance. This is not a critical item. For those few diehard old-timers who insist on minimum loss at 28 MHz and insist on using 300 or 450 ohm twinlead with a 4:1 balun or antenna tuner, you have been around long enough to know how to deal with that type of transmission line.

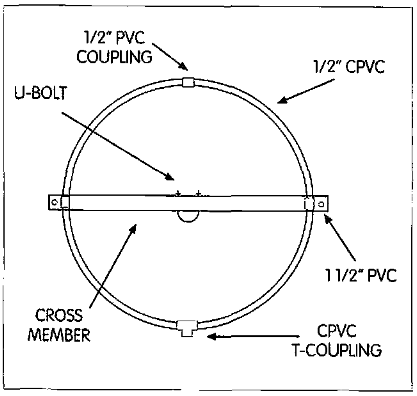

Fig. 3. Element mounting details.

Once you have determined that the tower is 22 feet tall or higher, then you can determine the physical length of the coax for proper operation (i.e., odd multiple of one-half wavelengths x VF at the lowest frequency that the cable is going to be used on—even at 1.8 MHz if you are remotely switching it to a 160 meter system). Also make sure, for propagation and safety reasons, that the shield of the coax is grounded at the base of the tower.

Now we can begin with the construction of the antenna system. The bill of materials shown in **Table 1** will be needed to make a good healthy antenna that has been proven to go through ice, snow, and 80 mph winds safely. The main reason is that it is extremely light in weight and very flexible. The rotor system will also benefit with this type of antenna system. One warning given is that the plastic should not be painted with anything. For an example, should black primer be used, summer sunshine will raise the temperature above the 200° F level and disaster will set in!

The source of a 10-foot boom is any place that sells chain link fence. This is a top rail made to telescope into another, so 20 feet or so of boom is possible. The optional 5-foot mast is in case your present mast does not extend 5 feet above the tower. If you need a mechanical system to connect the mast to the boom, the use of aluminum plates and stainless U-bolts is recommended. The additional couple of stainless bolts and nuts to secure the boom and mast to the plate for guaranteed non-slip is well worth the two dollars. Climbing towers is not my idea of fun.

Now that we have spent time and money purchasing and bringing home the plumbing and construction components, let's put together a nice looking quad antenna system. It must be noted that the general practice is to install a gamma match system to match the antenna array and coax impedances and to establish a balanced loading condition. I found that on the circular element

Parts List	
Qty.	**Description**
4	1.5" PVC-DWV drain pipe 10 ft.
3	1.5" PVC-DWV couplings
12	0.5" CPVC water pipe 10 ft.
9	0.5" CPVC water pipe couplings
3	0.5" CPVC water pipe T-couplings
1	1-5/8" galv. steel tubing 10 ft. (fence rail)
110 ft.	#14 or #12 AWG bare copper wire
3	4" x 8" galv. steel perforated plate (decks)
12	#6-1/2 stainless steel sheet metal screws
3	1.5" steel U-bolts, long (PVC-to-boom)
6	#1/4 x 3" galv. steel bolts (end cross member)
12	#1/4 nuts (use on item above, double nut)
1 can ea.	PVC cleaner, PVC/CPVC glue
Optional	
1	10" x 10" aluminum plate (0.25" thick)
2	1.5" galv. steel U-bolts (short)
2	2" galv. steel U-bolts (short)
2	#1/4 x 2" galv. steel bolts/nuts
1	1-7/8" x 5 ft. galv. steel mast (fence pole)

Table 1. Parts list.

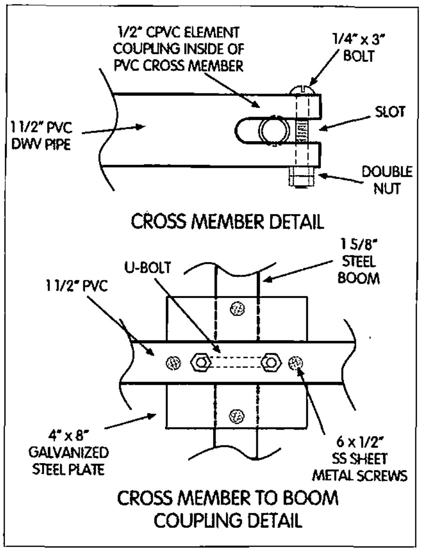

Fig. 4. Cross member and boom mounting details.

quads in particular, the driven element must be broken at the feedpoint to get it to comply with standard gamma match systems. After putting on the gamma match, a good match was accomplished. However, for unknown reasons the received signal was diminished considerably with the use of AC coupling vs. DC coupling (no gamma). So for simplicity and performance sake, a direct coupling unbalanced termination was made that resulted in excellent performance. Do what works!

First, make the driven element. It is being cut for approximately 28.4 MHz center. This results in about 35 feet of total length. Take four of the CPVC pipes and cut off the ends to achieve a length of 8 feet 9 inches, which equals a circumference of 35 feet. Cut a 36-foot length of copper wire and begin inserting into the end of the first section of pipe. When it reaches the end, clean the surface of the CPVC pipe and a coupling. Then apply glue and couple. Ensure that these pipes are lying on a relatively flat surface. Continue to insert the copper wire one section at a time. When all four sections are put together, use a T-coupling CPVC to complete the loop, ensuring that the ends of the copper wire are drawn through the holes in the T-coupling. See the drawing. Now insert an SO-239 or N coax receptacle. This is done with one copper wire to a solder

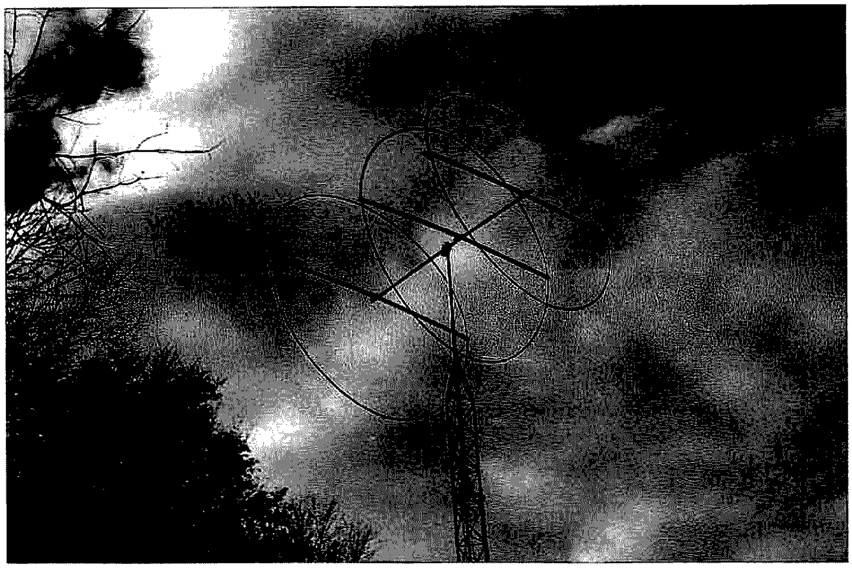

Photo A. K8IHQ's circular quad is an impressive sight.

lug attached to a screw on the flange of the receptacle and the other wire soldered to the center terminal. Now push into the T-coupling opening after applying some clear silicone caulk. Let it set overnight to ensure setup of the caulk. The next day, connect the coax to the element and test it with low power for SWR and frequency centering. Usable bandwidth should be in excess of 400 kHz, with a 1.3:1 or less SWR rising up to 1.7:1 for approximately 800 kHz. Most modern transceivers require the use of an antenna tuner; therefore the antenna will give a 1:1 SWR after tuning over the entire 10 meter band (28.1 through 29.7 MHz). Quads are low Q resonators and therefore have wide bandwidth.

While the driven element is stabilizing, work on the director and reflector elements can be done. Starting with the reflector element, the next four CPVC pipes can be cut to 9 feet 2 inches, which relates to approximately 36.5 feet in circumference or approximately 4% larger than the driven element. Note that the spacing on the boom will be 6 feet, resulting in a 0.17 lambda. This space has been shown to give best results as a reflector element. Again, cut off a 38-foot piece of copper wire and insert and assemble the reflector as was done with the driven element. Ensure that the T-connector is facing outward from the loop so that it will face the ground when hoisted into position. Before gluing this connector, make sure each end of the copper wire comes through the opening. Take each end and wind around the outside of the CPVC tubing as per the detail drawing, i.e., two loops, and cut. This will ensure that nothing bad happens when everything is hoisted into position. Again, the length of the copper wire is not super critical. Allow the opening on the T-connector to remain open (do not close with caulk)—condensation must be able to vent from the tubing.

Next is the director element. Construct it as the reflector element. Cut four CPVC pipes to a length of 8 feet 4 inches each. This will result in a 33.5-foot circumference, again 4% shorter then the driven element. This will be mounted about 4 feet in front of the driven element, which relates to a 0.11 lambda spacing. Terminate the copper wire as was done on the reflector element.

Now that we have the elements made, we must insert the horizontal cross members for boom mounting. These cross members are made of PVC-DWV 1.5" plastic pipe. Take one of the pipes and cut the following pieces: reflector, 18 inches (11 feet 6

Continued on page 25

Photo B. Closer view of beam and elements.

Elements	
Reflector	4 x 9 ft. 2 in. pipes (36.5 ft.) — +4%
Driven	4 x 8 ft. 9 in. pipes (35.0 ft.) — 0%
Director	4 x 8 ft. 4 in. pipes (33.5 ft.) — -4%
Cross Members	
Reflector	11 ft. 6 in.
Driven	11 ft. 0 in.
Director	10 ft. 6 in.

Table 2. Lengths.

From the Ukraine: A Radio Amateur's Story

Part 2: Water-cooled amp? Why not?!

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My teenage interest in amateur radio helped me make the right choice for a profession. In 1966, I became a first-year student at the Kharkiv Institute of Radioelectronics.

I was very surprised to discover that there was neither an amateur radio club nor a station there. After short investigation, I learned that a formal license and club callsign, UT5KDS, had been issued. However, there was neither a room nor equipment for the radio station. I took the initiative and contacted the Institute's authorities, and it worked! Within a few months, we were given a rather large room on the top floor. It was an archives room, and there were no windows. But we young hams were delighted—especially to be so close to the roof for our antennas! We applied our youthful energies, and in a short time we made our station a reality. The authorities, and some of the faculty, gave us some old but unused equipment. The best gift of all was a military HF receiver; it covered all amateur bands and it was in complete working condition.

I should mention here that in the late '60s, in the former USSR, most amateurs still used separate receivers and transmitters. And in most cases, transmitters were homemade. During this time, I acquired an old German three-stage CW transmitter, a relic of WWII. It was a rather big and heavy metal box containing a few tubes of unusual and strange construction. Unfortunately, I was unable to find direct replacements or even substitutes. I completely rebuilt this unit into a power amplifier, and ended up using only the big cabinet and heavy-duty RF power parts. Later on we made an exciter, and put up a few longwire antennas.

After all of our preparations, our student amateur radio club finally got on the air. It was September 1967. The club station soon became the center of activity for new hams entering the Institute each year, and for a lot of newcomers who also wanted to become involved with the magic world of shortwaves.

But the Morse code barrier stopped them. I needed to do something to help them overcome this barrier.

I soon established a Morse training class. This complicated my already busy student life. I had all of the normal duties and responsibilities of a student—lectures to attend and laboratory exercises to do—except that I no longer had free time! While other students enjoyed their free time, I had to run either to the top floor or to the basement to conduct Morse classes. I conducted two-hour Morse classes twice per week, and it produced results. Soon there were more and more active CW operators of UT5KDS taking their first steps on their journey to become amateur radio operators. Most of this activity was on the 7 MHz band, because there were enough stations there operating rather slowly. And this band was open every day in any season.

Let me take a step backward and reminisce for a moment. In the springtime of 1967, I had recently learned Morse code, and I made my first CW QSOs on 28 MHz at my home station, UB5EFP. I now wanted to get a higher-category license, and I would need more HF practice. During my summer vacation in 1967, I went to Oblast's

Photo A. Young students at club station UK5LAP in 1973. Author's younger sister Natasha UB5LEZ is listening on the band. At center, Valentin Mykitenko UB5LEQ. Who could have known that he would become a famous operator from the Arctic and Antarctica, eventually owning 11 callsigns recognized around the world! At left is Alexander Goncharov, now RA3ZZ, but 4K1ZZ from Antarctica.

radio club, UB5KBB. While there, I asked to make a couple of CW QSOs on HF bands.

The chief allowed me to work under his control on 40 meters. With trembling heart and fingers, I sent my first CQ there. I got an answer from the operator, Misha, on the Crimean peninsula in the southern Ukraine. After some ordinary conversation, now possible with my knowledge of Morse code, I was pleased and satisfied with this first QSO on real HF with real QRM. This QSO remains in my memory after all these long years.

But let me return to the students' radio club ...

In the fall of 1968, we met the new operators entering as first-year students. I'm sure you can appreciate how surprised I was to meet one of the new students: It was Misha, the same operator with whom I made my first QSO on UB5KBB! As an operator, he was rather experienced and it was easy to work with him. Misha made hundreds of QSOs and participated in many USSR contests, and he was an active DX hunter.

Once the winter examination sessions of 1969 were over, we watched for DX openings on 10 meters. It was a time of good solar activity, and during February there were beautiful days with propagation from North America. There were terrific signals for a couple hours every afternoon, and after each CQ or QRZ, we got a real pileup. There were so many stations from the USA calling us, it was really hard to operate. Misha and I rotated every hour, and still we were very tired—but we were really happy to feel that pleasant tiredness. It was a new experience to be in a role of DX. After several evenings, we found that it was better to operate while monitoring the band together, with two pairs of headphones. Almost 30 years have passed, but I still remember those impressive openings on ten meters.

Unusual QSOs

Victor Polchaninov UT5TG, a faculty engineer and one of UT5KDS's operators, went on the Institute's 1969 Antarctica expedition. The faculty were conducting scientific research in the upper atmosphere, and Victor's assignment was to take care of the measurement equipment. The expedition was headquartered at Molodezhnaya, at that time one of newest of the USSR's scientific bases.

The equipment worked properly, leaving Victor with plenty of time to organize a ham shack there.

Perhaps an explanation is required here: In past years, not every expedition had an amateur radio operator included in the expeditionary crew, and there were no fixed amateur radio positions on the bases. Even the callsign, UA1KAE, was a community one, and required a licensed amateur radio operator. Most radio communications were conducted using the standard communications center. Sometimes amateurs would set up their own stations by using equipment brought from home. This allowed them to operate from their own work site or living quarters. The callsign UA1KAE was reserved for the Russian Antarctica "capital," Mirny base. At the Molodezhnaya base, UT5TG used a slightly modified callsign, UA1KAE/1. Operation using your home or other special callsign was prohibited.

Victor rebuilt an old, surplus scientific HF radar antenna for 28 MHz operation. The landscape would not permit him to install higher and longer antennas for the lower bands. You must remember that Antarctica is an icy continent, and there are no trees or high buildings. Victor also built a power amp to provide a couple hundred watts, and he was now ready to operate CW on ten meters. But, in spite of the best equipment, radio frequency communication ultimately depends on wave propagation. From here in the Ukraine, it seemed like it could be accomplished very easily, because during the fall of 1969 and winter of 1970 there were frequent openings from UB5 to PY, LU, CX, YV, and so on. But, in fact, those ionospheric refractions were good only for the middle latitudes, and absolutely different for polar regions. This is true for both the north and south polar areas.

I spent a couple of months at UT5KDS monitoring ten meters, when the band was open to South America. But QSOs with UA1KAE/1 were very seldom, and after several attempts, we

agreed with Victor to check only one frequency, 28.560 kHz, every Tuesday and Friday at 5 p.m. This was a good time, because the working day was over, and Victor's strong signal would not interfere with scientific measurements.

I was so surprised when this schedule began to work! After several attempts, I found that I could hear his weak CW signal regardless of band conditions. However, signals were 539-559 during most of time, and the narrow bandwidth signals were excellent to read. The most significant thing about this was that it was repeated every day at the appointed schedule. The only exceptions were when something interrupted Victor's normal life there in Antarctica, or mine there at my QTH.

When the summer season of 1970 came, the band was quiet and seemed almost dead. Only domestic or short-skip signals were heard, but nonetheless our weekly skeds were unusually stable. Twice per week, for several months, we had CW contacts with Victor. We exchanged amateur news, and often he received regards from his family. Even the chief of the faculty was quite surprised at how fast and reliably we were connected with Antarctica via amateur radio. Many times he visited our radio shack to watch the sked in operation while the band conditions were otherwise very poor.

We were all very surprised by the nature of this phenomenon, and its unusual propagation. Thirty years have passed, and I'm still seeking an explanation. Perhaps we amateurs experienced this anomalous phenomenon for the first time. To our understanding, it was propagation along the line of the Earth's magnetic field. Perhaps science can now explain the true nature of this wave link between two points, one in the northern hemisphere and the other in the southern one, connected by almost the same meridian. But we ham radio operators were happy and proud to have experienced such a previously unknown matter.

Field Day 1970

The operators of UT5KDS in 1970 were oriented exclusively to CW operation on shortwave. We simply did not have an SSB exciter, and Morse code mode was all that was available. Most of time, after our lessons and laboratory work, we students would spend several hours on 40 and 20 meters. These were our favorite bands.

Our first experience with VHF was due to the enthusiasm of Vadim Shevchenko UB5BUK. He worked as an assistant in one of the faculty laboratories. Vadim told us stories about 2 meter operation, but we weren't very interested because it seemed to us like very short distances were covered in a very complicated way. Vadim and his fellow VHF enthusiasts planned to be in an annual Field Day contest. But they didn't operate CW at all, and they asked me and Misha to join them. We agreed. This would give me a chance to observe and participate in a VHF event. It would also provide experience with other kinds of amateur equipment and new operating techniques, and an opportunity to share our CW skills.

Once again, let me take a step backward and explain our contest rules ...

In the former USSR, during those years there was only one Field Day per year, exclusively on VHF and UHF. Participants were spread all over the

countryside, trying to occupy a place atop the high hills and at reasonable distances from other participants. The usual practice was to use an ordinary home callsign and add "/P". There was another large group of participants operating from their homes. They were in another category and earned fewer points per QSO. During the contest, there were three periods of 6 hours: one session each for 144, 432, and 1296 MHz. CW and phone (AM) modes were allowed, with repeating QSOs with the same participants after one hour. Our team was oriented mostly on the 2 meter band, but we also had one set of equipment for 432 MHz.

The Institute authorities helped me with transport, and we loaded a whole lorry with numerous bags and boxes containing rather heavy equipment—including a tall mast and huge antennas. We transported this cargo to the position we had selected. It was 60 km north of Kharkiv and close to the Russian border. Our site was the highest point in the area. It was marked by an old wooden triangle sign at the top of a small artificial hill. It looked like a green island in a center of a huge field of flowering buckwheat. There were no trees nearby, and we had a nice view to the horizon in any direction. It was a beautiful sunny summer day, and the whole field was white with buckwheat blossoms. In this country, this is one of the favorite plants of bees. It baits them with delightful fragrance and sweet nectar. The air around had a beautiful honey smell. We, mostly indoors people, were very impressed by this wonderful, clear day.

First of all, we installed the big yellow tent for our operating position. Then we began assembling a big antenna for the 2 meter band. It was a 15-element-long yagi with a 30-foot-tall mast. All of us left our other duties and concentrated our energies on erecting this antenna. Three of us were in the center near the mast, and the rest were holding the supporting guy wires. Once the mast was in the vertical position, one of our crew wired the ends of the guys to the anchors already hammered into the soil.

We were all dressed as though on an outing at the beach. It was a nice opportunity to expose our pale indoors bodies to the sunbeams. Suddenly, our attention was attracted by the shouting of UB5BUK. He was jumping like a dancer and making a terrific noise. But we couldn't understand what was happening. He was clutching the guy wire to support the antenna mast and could not let it loose. The reason for the noise and wild jumping was a small bee. The buckwheat plants in that place were tall and waist-deep. And one bee working at the flowers had stung him just between the legs ...

At last everything was arranged, and we were prepared to start the contest. Equipment was switched on. It was almost all home-built, except for the receiver, which was an old military one. I have to emphasize that everything was completely tube-type equipment. Semiconductors were almost not present there—only rectifiers in the power supplies. We used separate receivers and crystal-controlled single-frequency transmitters. Low-noise converters transferred weak signals from 144 MHz to some portion of the HF spectrum.

The most memorable piece of equipment was the power amplifier. I remember well this original construction design by Nick Zinchenko UB5GNZ. As shown in **Fig. 1**, it employed a ceramic triode in grounded grid configuration with a quarter wavelength output coaxial resonator. Outer and inner conductors were made of copper tubing. Flanges were provided at the ends, and a thin Teflon film insulator was used to make a VHF shortening capacitor on the end opposite the triode end of the resonator.

Physically, the resonator's length was shorter then a quarter wavelength. It allowed use of a tuning capacitor in the form of a metal disk placed near the anode end. RF energy was taken from the coupling loop near the closed end of the resonator. We also used an external coaxial relay to change the antenna from the receiver to transmitter.

The input parts of the power amp were not so interesting and are not shown in the figure. The most unique part of this construction was the water cooling system for the tube. The inner resonator's conductor was made in the form of a cavity. It used part of a stainless steel pipe to deliver cooling water to the source of heating—the plate end. The choice of material was made to ensure poor thermal conductivity of the pipe, and to provide convectional flow of the distilled water in the resonator. Hot water moved up to a short piece of pipe at the right upper corner. It used an external glass water tank for cooling the water. The tank and resonator were connected by two pieces of rubber medical tubing. Also, the air bubbles disappeared in this tank to allow the normal convection flow. Today, looking back, it was an overly complicated system, but it was passive and quite effective. The water was also under high DC potential, and of course, it was dangerous. But this solution for cooling the tube plate is, to my knowledge, unique in amateur practice. This PA delivered 50 W of RF power and, in combination with a long yagi antenna and good operating site, it

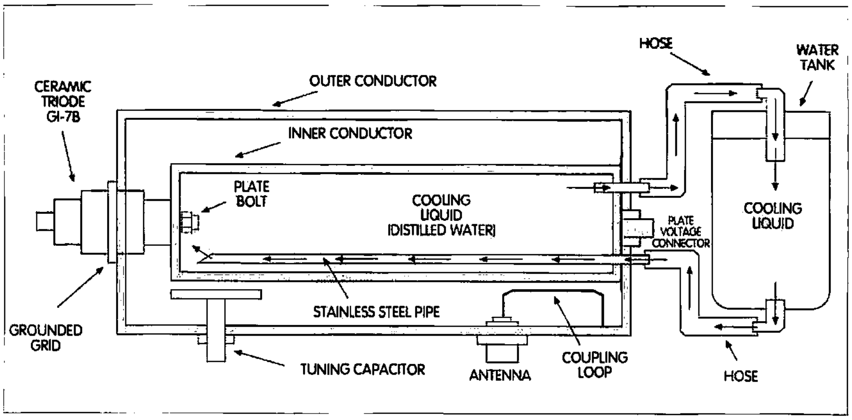

Fig. 1. UB5GNZ's water-cooled amp.

provided the possibility of good results in the contest.

The details of the contest itself are not really important. However, our most significant objective was to contact someone from the northerly direction—someone in Russia.

Most of the accessible Field Day contesters were from the southeastern Ukraine, because this area contained highly developed industry and larger concentrations of radio amateurs. No one had ever worked our northern neighbor country previously on 2 meters, but we knew that Russian amateurs were also pointing their antennas toward us. Our task was to face one another pattern-to-pattern at just the right time. After several attempts, I found weak CW signals from Russia. As I recall, it was UA3KYB. We had a nice QSO, and after one hour repeated again. It gave us some very good points for the contest. But, most of all, I'm still proud that it was a truly historical moment: the first QSO between Ukraine and Russia on 2 meters had became a reality. It was in June 1970 ...

Note: The names of all fellows mentioned here are real, but some callsigns were changed later several times. The club station for our students became UK5LAP and this new callsign took its place in thousands of amateur logs all over the world.

I would like to express my gratitude to my friend David Evison W7DE, for reading and preliminarily editing (in a language sense) this article. 73

Three-Element Circular Quad

continued from page 20

inches) total; driven, 12 inches (11 feet 0 inches) total; and director, six inches (10 feet 6 inches) total.

Take these pieces and glue to each additional 10-foot pipe to make the required lengths. Now take a hack saw and cut 0.5"-wide, 2"-deep cuts in the pipe as per the drawing. Pliers can be used to remove the excess to clear the slots. Now place the cross member into each loop. Drill holes into the cross members to accommodate the 1/4" x 3" bolts as per the detail drawing. These slots and bolts will keep the coupling of the element locked into place.

Now drill holes to accommodate the U-bolts per the detail drawing, ensuring that the U- bolt is centered. Next, drill holes into the center of the galvanized plates and insert pipe, bolt, and plate together. Now drill very small holes through the plate and PVC pipe so as to allow a stainless steel sheet metal screw to anchor the plate to the pipe.

Now the element is ready for mounting onto the boom. When all the elements are done, mounting on the boom may take place. I recommend that this be done at ground level. Once the elements are mounted to the boom, again drill small holes at the end of the plates as before and attach two stainless steel screws through the plate and into the galvanized steel boom. Once assembly is completed, connect the coax and test with low power RF. SWR will be 2:1 or a little more while on the ground. The 1.1:1 or better will be seen once the antenna is aloft.

This antenna system did not require very many hours of construction time nor a lot of bucks to obtain 9 dB gain over a dipole system. The DX will hear you very respectfully with just 100 watts. Good DX! 73

Easy Antenna Reference

Part 2: More options.

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Part 1 of this article (February 1999) covered some quick and easy basics to enable you to make some simple decisions. Here, we'll look at some more options.

To round off the simple approach, let's consider the antennas in **Figs. 1** and **2**. An easy-to-construct antenna is the folded quarter-wave. This antenna is a variation of a ground-plane antenna and works best with a good ground-plane or resonant radials. Theoretically, it should exhibit a feed impedance of 39 ohms and may be fed with 50-ohm coaxial cable. An antenna tuner will most likely be required.

The antenna consists of a quarter-wavelength of heavy-duty wire with an insulated support at the point where the wire changes from vertical to horizontal (or thereabouts). The length may be calculated by dividing 234 by the frequency of operation in megahertz. The answer is in feet. As always, be generous and make the antenna too long—then prune to resonance. Make the largest amount possible vertical and then put the remainder in a horizontal position. If this is not possible, one support allowing a sloper (diagonal) erection will still give fair results.

Should you suffer from lack of real estate, then the folded "T" configuration may be your solution. I suggest that this antenna be made from slotted 300-ohm ribbon. The horizontal section of the "T" may be calculated from $270/f_{MHz}$, the answer again being in feet. Each end is shorted, and the center of one side opened to join the ribbon feeder. Calculate the feeder length by multiplying 270 by the velocity factor and dividing the answer by the operating frequency in megahertz. A typical velocity factor for this type of ribbon is about 0.82. This is claimed to give an approximate 50-ohm feedpoint. Expect to use an antenna tuner for best results.

For the higher frequency bands, another wire antenna that radiates vertically with broad bidirectional lobes is illustrated in **Fig. 3**. It is simple to feed with 50-ohm coaxial cable, and with a gain of 3 dB over a ground-plane, it gives good results over a fixed beam area.

This does not at all exhaust the configurations of simple wire antennas.

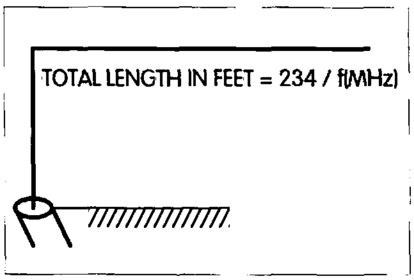

Fig. 1. Folded quarter-wave antenna.

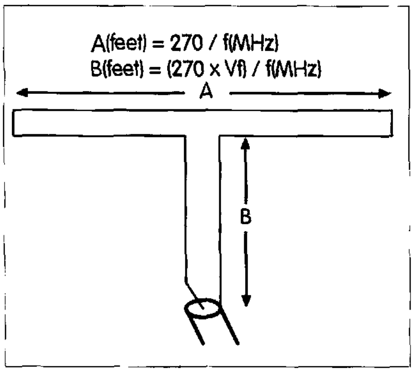

Fig. 2. "T" antenna.

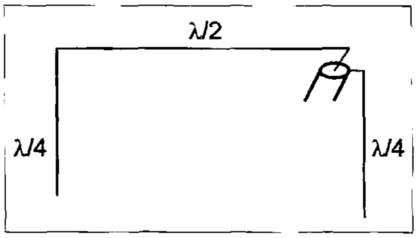

Fig. 3. Phased verticals.

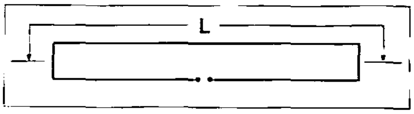

Fig. 4. Folded dipole measurement.

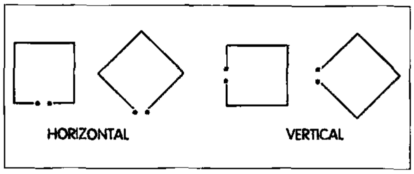

Fig. 5. Polarization of quad antennas, based on orientation of feedpoint.

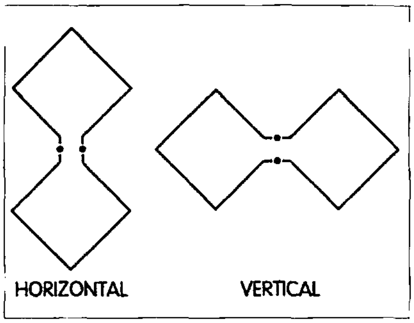

Fig. 6. Dual-quad configuration.

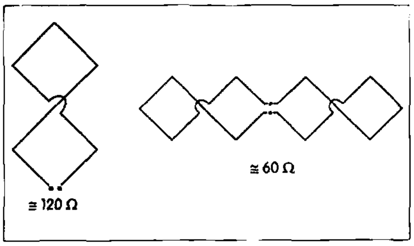

Fig. 7. Other quad combination suggestions.

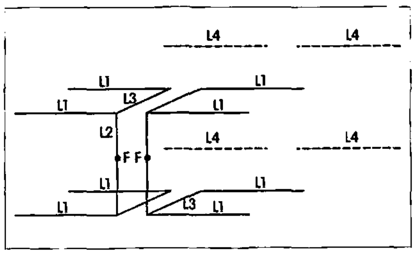

Fig. 8. Extended flat-top beam, with gain of approximately 10–12 dBd.

Having promised to pass on information about quad antenna configurations, I will endeavor to do so after the following brief interlude.

One question I have often heard is, "How do you measure the elements of a folded dipole?" Assume that the folded dipole is for VHF/UHF, made of aluminum tubing, and self-supporting, somewhat such as used in a TV antenna. The length dimension applies to the overall length of the unsplit element from the midpoint of one end jumper to the midpoint of the other end jumper. This is illustrated in **Fig. 4**. The impedance of the folded dipole (half-wave) is four times that of a single half-wave dipole in the same surroundings, such as supports or additional elements. It is assumed that the upper and lower elements of the folded dipole are the same diameter.

An easy-to-remember method of calculating the length of a folded dipole is to divide 5555 by the operating frequency in megahertz. The answer is in inches, e.g., 5555/147.4 equals 37.6865 inches, or 37-5/8 inches. The big factor in favor of folded dipoles is their wide bandwidth of operation—hence the reason for their use in many TV antennas.

A useful, simple antenna is the quad. As illustrated in **Fig. 5**, it may be fed to give vertical or horizontal polarization. The total length of wire used to make a quad may be calculated by dividing 1005 by the frequency in megahertz to give the answer in feet. In metric, divide 306,324 by the frequency in megahertz to give the answer in millimeters. The quad exhibits approximately 100–125 ohms impedance, which varies with supports, height, and surrounding objects. It has an approximate gain of 1.5 dB over a dipole and a lower angle of radiation. A close match to 50-ohm coaxial feeder may be obtained by using an electrical quarter-wavelength of 75-ohm coaxial cable between the feedpoint and the 50-ohm feeder.

The dual-quad configuration, **Fig. 6**, gives a bidirectional pattern with a reasonable gain of approximately 3–4.5 dBd. The horizontally polarized configuration produces a good low angle of radiation. The size of this configuration may limit it to the upper frequency bands. In **Fig. 7**, another dual-quad configuration is shown. Some enterprising amateur might like to parallel two of these in the horizontal plane, both increasing the bidirectional gain and

	21.2 MHz	28.4 MHz
L1	6722 mm	5018 mm
L2	7076 mm	5282 mm
L3	3538 mm	2641 mm
L4	6504 mm	4855 mm
L5	1415 mm	1056 mm

Table 1. (See ***Fig. 8.****) A broadband, high-gain antenna sometimes referred to as a "Lazy H." Note that tuned feeders connect to the points marked F.*

reducing the feedpoint impedance to approximately 50 ohms. At 28.4 MHz, such an array would be about 100 feet long and approximately twelve-and-a-half feet high.

Finally, for those amateurs who like to challenge the elements (literally) and have the room, **Fig. 8** shows details of the extended flat-top beam. It may be built with or without directors, which are spaced at about one tenth of a wavelength (see dimension L5 in **Table 1**). Best results may be obtained using open-wire feeder and an antenna tuner. If a quarter-wave shorted stub is used, the system could be matched to a coaxial cable transmission line.

Screwy Mobile Antenna Mods

Fine-tune that screwdriver-type with these helpful tips.

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I use a motor-tunable screwdriver-type mobile antenna for HF mobiling. My mobile antenna is an H-100 High Sierra™ model that actually was a gift from Dennis Peacock WB4KEA.

After installing the antenna on the left rear of my 1993 Camry, the initial test of the H-100 indicated that the best VSWR obtainable anywhere from 80 through 10 meters was 3.0:1, regardless of the location of the tap on the bifilar-wound matching transformer. Also, the location of the DC power leads for the motor affected performance of the antenna.

The DC power leads affected antenna performance because the leads were coupled at RF frequencies to the antenna through the antenna motor. At the point of exit from the antenna mast, 140 μH inductors were placed in series with each DC lead to decouple the antenna.

Freq. (MHz)	R (Ohms)	X (Ohms)	VSWR (:1)
3.831	16	4	3.3
7.134	15	3	3.5
14.07	37	2	1.3
21.0	49	4	1.0
29.5	48	2	1.0

Table 1. *Measurements with matching transformer removed.*

With the matching transformer removed, the antenna could be matched to 50-ohm coax by switching in discrete capacitors for each band. However, switching bands required not only tuning the antenna, but also stopping the automobile and switching in the appropriate capacitor at the antenna base for the band of intended use. A fixed, broadbanded matching circuit was needed that covered 80 through 10 meters. My solution was the circuit described below.

With the matching transformer removed, the antenna measurements shown in **Table 1** were made with my MFJ-259B.

Unfortunately, the MFJ-259B does not read the sign of the X component. However, the reactive component is believed to be very near zero at the antenna because the antenna impedances were measured through 1.5 feet of coax. If a load of 15 + j0 were measured through 1.5 feet of 50-ohm coax, the measured impedance at 7.2 MHz would be 15.17 + j4.03.

The 80 and 40 meter impedances required transforming approximately 15 ohms to 50 ohms. However, the 20-meter band and above impedances did not require any transformation to obtain a 1.3:1 VSWR match.

Two L sections were chosen to transform 15 ohms to 50 ohms at 80 through 40 meters in order that a lower Q per section could be used, resulting in greater bandwidth.

High pass L sections were chosen over complementary L sections (with the loss of some bandwidth at 80 and

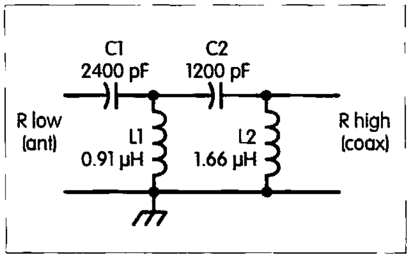

Fig. 1. *High pass L matching circuit. C1: two 1200 pF 500 V silver mica capacitors in parallel. C2: 1200 pF 500 V silver mica capacitor. L1: 4-3/4 turns #20 wire, close-wound on 1-1/16-inch o.d., 2-inch-long PVC pipe. L2: 6-3/4 turns #20 wire close-wound on the opposite end of the PVC pipe from L1.*

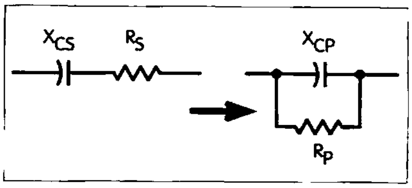

Fig. 2. Series/parallel equivalent circuit. $Q = Xcs/Rs$. $Rp = Rs(1 + Q^2)$. $Xcp = Xcs(1 + 1/Q^2)$.

Freq. (MHz)	R (Ohms)	X (Ohms)	VSWR (:1)
3.8	52	0	1.0
7.0	50	15	1.3
14.2	42	3	1.1
21.4	49	0	1.0
29.6	48	8	1.1

***Table 2.** Measurements with L matching unit at base of antenna.*

Freq.	VSWR
3.5	1.4:1
3.8	1.3:1
4.0	1.2:1
7.0	1.2:1
7.3	1.2:1
14.0	1.2:1
14.3	1.2:1
21.0	1.2:1
21.45	1.2:1

***Table 3.** AC4TK measurements with 500 W into matching unit.*

40 meters) so that the matching circuit would act as a high pass circuit and allow the transmitter to "see" the actual antenna impedance without transformation at 20 meters and above. The circuit is shown in **Fig. 1**.

The formulas used here are algebraic variations of the fundamental series to parallel equivalent circuit transformations as shown in **Fig. 2**. The minimum Q that is required for the 15:50 impedance transformation is 0.9 per L section. The transformation in the first L section is $15(1 + Q^2) = Rt$, and the second L section is $Rt(1 + Q^2) = 50$. Therefore, two independent equations yield: $1 + 2Q^2 + Q^4 = 50/15$. Solving for Q, Q = 0.9.

The first L section comprising C1 and L1 transforms as follows:

Equivalent R seen across L1 is R low $(1 + Q1^2) = 15(1.81) = 27.15$ ohms. X_{C1} is selected to result in the appropriate Q of 0.9. $Q1 = X_{C1}/R$ low, $0.9 = X_{C1}/15$, $X_{C1} = -13.5$.

Equivalent X_C across L1 is $X_{C1}(1 + 1/Q1^2)$, $-13.5(1 + 1.23) = -30.16$. The magnitude of X_{L1} = equivalent X_C, $X_{L1} = +30.16$.

The second L section comprising C2 and L2 transforms as follows:

Equivalent R seen across L2 is R transformed x $(1+Q2^2)$, $27.15(1.81) = 49.17$ ohms.

X_{C2} is selected to result in the appropriate Q of 0.9. $Q2 = X_{C2}/R$ transformed, $0.9 = X_{C2}/27.15$, $X_{C2} = -24.45$.

Equivalent X_C across L2 is $X_{C2}(1 + 1/Q2^2)$, $-24.45(1 + 1.23) = -54.64$.

The magnitude of X_{L2} = equivalent X_C, $X_{L1} = +54.64$.

Component values were selected at the geometric mean frequency between 3.8 and 7.3 MHz, or 5.26 MHz. F is the square root of (3.8 x 7.3) so that the network would transform at 3.8 MHz equally as well as at 7.2 MHz. Decreasing the value of C1 will favor 7.2 MHz at the expense of 3.8 MHz. In like fashion, raising the value C1 will improve the VSWR at 3.8 MHz at the expense of 7.2 MHz.

$C = 1/(2\pi FX_C)$ and $L = X_L/(2\pi F)$. Therefore, C1 = 2241 pF; L1 = 0.91 µH; C2 = 1237 pF; and L2 = 1.66 µH.

For the actual component values used, see **Fig. 1**. The measured results after installing the L matching circuit at the base of the antenna were as shown in **Table 2**.

Tony Faucher AC4TK was also having trouble getting his 500-watt Ameritron™ amplifier to work into his later model HS-1500 High Sierra™ antenna, because the amplifier is set at the factory to shut down if the load presents a VSWR of greater than 2:1 with 500 watts output. Therefore, Tony elected to try the above-described matching circuit. Tony obtained the

Continued on page 32

Operating Crystals on the Fifth Overtone

Sounds kinda New Age, but it's something all hams should know.

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Almost all crystals, whether constructed for overtone service or not, can be made to oscillate on approximately odd multiples of their fundamental frequency. For many years the circuit shown in **Fig. 1** has been used in handbooks. We are led to believe that by tuning the tank circuit in the collector to three, five, seven, or nine times the crystal frequency, the crystal is made to oscillate on one of its odd overtones. And it works fine for the third overtone, but not so well for the fifth overtone. I've never succeeded in getting it to work on the seventh overtone, or higher, when using fundamental-type crystals.

So what's the problem?

Assume the tank circuit of **Fig. 1** is initially tuned to a frequency of about 50 kHz below five times the fundamental frequency of the crystal. For example, if X1 is a 10 MHz series-type fundamental crystal then assume LC is tuned to resonate at 49.950 MHz. As expected, this is too low and the circuit does not oscillate. Now, start tuning to a higher frequency by slowly decreasing the value of C (or L). You will reach a point where the circuit suddenly starts oscillating with an output level A1, shown in **Fig. 2**. The exact output frequency depends on the crystal's fifth overtone and not the tank tuning; that is, the crystal is in control. For the example above, it was measured as 49.976 MHz.

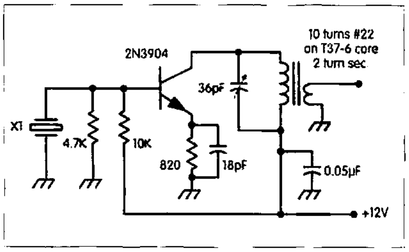

Fig. 1. Typical overtone oscillator circuit.

As the tank circuit is tuned even higher in frequency, the output level increases quite rapidly until at some point the circuit suddenly stops oscillating. For the fifth overtone, the starting and stopping points are close together, making the tuning quite critical. Worse, if the power is removed and reapplied, the circuit may not restart oscillating unless the tank is first detuned below the starting frequency and again slowly increased above the starting point. If you are lucky, a point can be found somewhere between the starting and stopping points where the circuit will restart oscillating when power is removed and reapplied. This point has to be found by trial and error, since tuning for maximum output will not get you to the proper point. Overall, this starting situation is not a very satisfactory solution for either homebrew or commercial equipment.

A better circuit

Referring to **Fig. 3**, we see a feedback-type oscillator circuit with the crystal connected between two low-impedance emitters. The tank circuit in

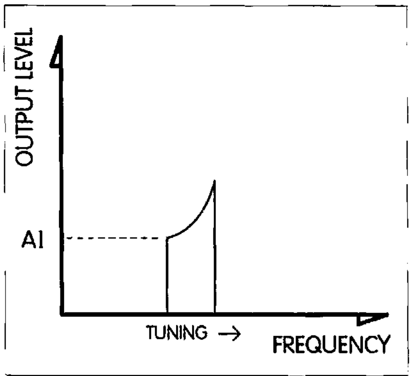

Fig. 2. Tuning typical circuit.

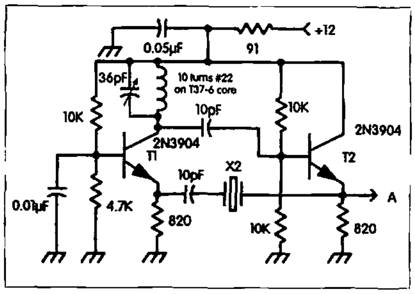

Fig. 3. Improved overtone circuit.

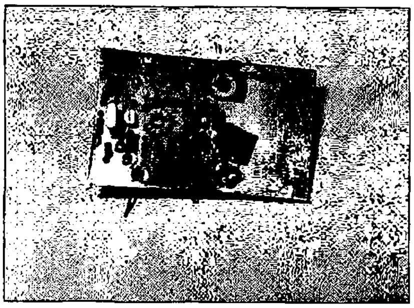
Photo A. Circuit board with oscillator, emitter follower, and class AB amplifier.

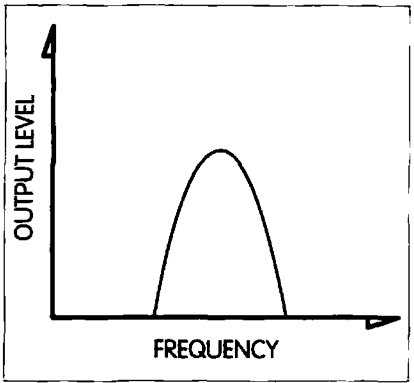

Fig. 4. Tuning of improved circuit.

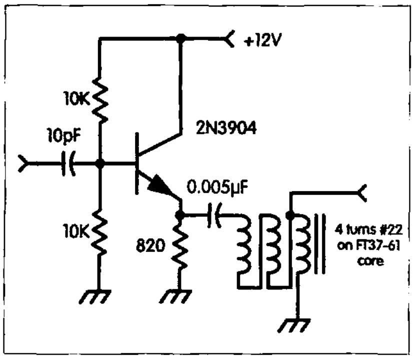

Fig. 5. Practical emitter follower circuit.

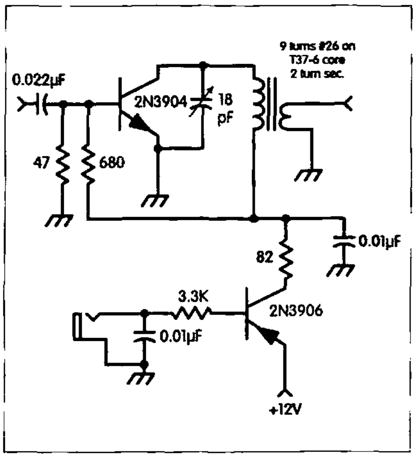

Fig. 6. Amplifier with keying circuit.

the collector of the common base circuit prevents oscillation at other than the desired overtone. This circuit works reliably on the fifth overtone.

Note the very different tuning curve in **Fig. 4**. The abrupt starting and stopping points are gone, and maximum output occurs as a broad peak centered at the overtone frequency. As before, the exact output frequency is determined by the crystal and not the tank circuit tuning.

When tuned to the correct peak frequency, this circuit generates about one milliwatt of power. However, it is best to avoid drawing power directly from the circuit. An emitter follower circuit attached to the relatively low-impedance point A (see **Fig. 3**) presents a minimal load, yet provides an output for driving 50 Ω or lower-value loads. A practical emitter follower circuit is shown in **Fig. 5**. Note the details for winding the RF transformer using a ferrite core.

But what's the frequency?

If you're lucky enough to have a crystal cut for fifth overtone oscillation, then the output frequency will be just what is marked on the crystal

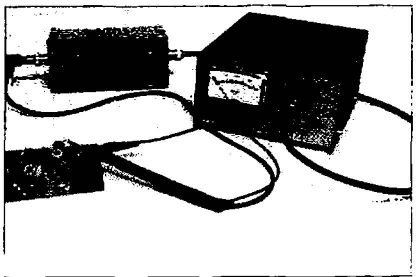
Photo B. Measuring the output level with step attenuator and dBm meter.

holder (can). Other crystals will oscillate on approximately five times their fundamental frequency. How approximate? The only way to find out is to build the circuit and measure the frequency. My microprocessor crystal marked 10 MHz actually oscillates at 49.972,590 MHz! That's with a 10 pF series capacitor, as shown in **Fig. 3**. The frequency can be "pulled" slightly (about 5 kHz) by varying this series capacitor from 5 to 20 pF, as shown in **Fig. 6**. Do not attempt to increase this capacitor much above 20 pF. Otherwise the crystal may lose control and the circuit will become a self-excited oscillator with the crystal appearing as a series capacitor (its holder capacitance). The frequency will then be determined by the tank circuit at the collector of T1. The frequency will now vary considerably as the tuning of this tank circuit is adjusted. That is fine if you want to build a VFO—but then you don't need a crystal at all!

Some authors have suggested adding an inductor in parallel with the crystal to cancel out the holder capacitance at the overtone frequency. This may help if you need to go to a higher series capacitor to "pull" your frequency a little lower. But it also introduces another inductor, which can introduce resonances and oscillating frequencies other than the one intended.

Stepping up the power

A class AB amplifier can be used to increase the power to 30–50 mW. It is also a good place to insert a keying circuit for CW, as it will not affect the frequency. See **Fig. 6** for a circuit developed by Hayward and DeMaw. A low-pass filter in the output attenuates harmonics.

Circuit construction

The final circuit, including oscillator, emitter follower, and class AB amplifier, is shown in **Photo A**. All the components are mounted on the foil side of single-sided epoxy-glass circuit board. Through holes are drilled and countersunk for clearance as component leads pass through the board. Interconnections are made on the back side using the component leads or extra wires as needed. The output frequency is easily measured on a frequency counter. I used the counter of an MFJ-259 SWR Analyzer. Output level, as shown in **Photo B**, is measured with an RF dBm meter. A step attenuator is also useful for making the level measurement. Note: The RF dBm meter and step attenuator are available in kit form from Unicorn Electronics, 1 Valley Plaza, Johnson City NY 13790; (800) 221-9454; [www.unicornelex.com].

Suggested reading:

Solid State Design for the Radio Amateur by Wes Hayward and Doug DeMaw, ARRL, Newington CT, 1986.

Radio Components Handbook by Guido Silva, MFJ Publishing, Starkville MS, 1997.

Screwy Mobile Antenna Mods

continued from page 29

results in **Table 3** when running 500 watts into the matcher:

The calculated loss of the matching circuit is believed to be in the order of 0.1 dB when the inductors have Qs of 100. An attempt to measure the loss with the MFJ-259B yielded an indicated 0-dB loss from 3.5 through 28.7 MHz.

Power	Peak Voltage	Freq. (MHz)	Load
100 W	67	3.5	Antenna tuned to 3.5
100 W	176	3.5	Open circuit
500 W	151	3.5	Antenna tuned to 3.5
500 W	394	3.5	Open circuit

Table 4. Calculated voltage stress on capacitors.

The calculated and modeled (but not measured) voltage stress on the capacitors is greatest on the smaller capacitor at the lowest operating frequency. The calculated voltages are shown in **Table 4**.

Therefore, 500 volt capacitors were selected.

In addition to the decoupling inductors on the DC lines and the matching circuit, Tony and I made the three following additional modifications to our High Sierra antennas:

1. To tighten the coil to antenna mast connection, a copper shim made of flattened 3/8-inch copper water pipe was placed inside the mast collar under the spring.

2. A 1 ohm 10 watt resistor was switchably added in series with the DC power leads to the motor to slow the coil movement at near resonance.

3. White nylon ties were placed around the transparent coil covering as band markers, visible through the rear view mirror.

In closing, I would like to thank Neill Fry K4AYD and Bill Earheart K4EGC for providing parts and technical assistance for this project, as well as Larry May K4QZF for inspirational encouragement. Each of these hams and others are part of the 3.8325 group which meets every morning at 8:00 a.m. CST ± QRM on 3.8325 MHz. I join the group on Saturdays and Sundays, and confess to having a strong compulsion to sway the topic under discussion in the direction of antennas.

My Old Kentucky (Satellite) Home

... where lofty aspirations met some down-to-earth concerns.

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Owensboro KY 42303

Part of amateur radio fun is indulging in the challenge of different modes of communication. After years of enjoying traditional QSOs on HF bands, two meters, 440, and slow-scan television, my husband Richard WA1GZY and I decided in the summer of 1996 that it was time to try satellite communications.

In selecting the right rig for this, we dealt only with monetary concerns and a few judgment calls. We finally settled on the ubiquitous Yaesu FT-736R.

However, our quest to send signals into space really began with antenna choice and installation, which at first presented us with seemingly insurmountable problems. Our heavily wooded back yard and the aesthetic concerns of neighbors (we live in suburbia) limited our existing antenna farm to a 50-foot Hazer tower near the back of our house topped with a triband three-element cubical quad that misses the roof only by several inches when we rotate it! Also, a Carolina Windom multiband dipole is tucked among tree branches.

The most logical approach for adding satellite-tracking antennas that could be rotated with ease seemed to be installation above the quad's boom. Before purchasing antennas, we pored over literature from the tower's manufacturer concerning weight restrictions. Then we measured the available space between quad elements and checked the quad antenna manufacturer's specifications.

Our preliminary work resulted in ordering the KLM 435-40CX for the 440 frequencies and the KLM 2M-14C for two meters. The boom lengths of those two antennas do not exceed the boom length of our quad, and the designs offer reasonable weight as well as some immunity to the harsh effects of rain and snow. One added bonus to the satellite antenna placement is that the circular polarity provides excellent

Photo A. *Scott KS4IN and Rich WA1GZY finish constructing an antenna.*

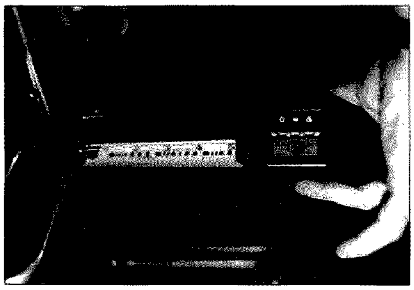

Photo B. Precise measurements ensure excellent results!

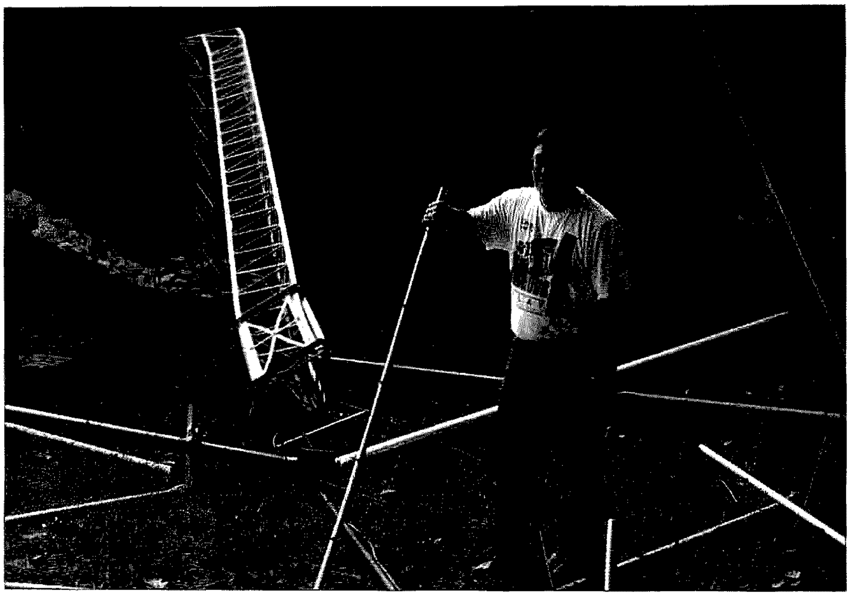

Photo D. The results of a brief summer storm in 1997.

terrestrial signals for two meter/70 cm SSB, long-distance FM repeater contacts, and ATV (amateur fast-scan television).

Building the antennas was neither a simple nor painless project (Richard burned his left hand while soldering by picking up the wrong end of the iron), but with the help of several friends and a quick trip to the emergency room, we persevered and were rewarded with out-of-this-world QSOs!

We began the project by familiarizing ourselves with KLM's instruction manuals, gathering tools, and arranging antenna elements in the proper order on a table near the work area. After boom assembly, we propped the ends of the 2M-14C and 435-40CX booms on chairs to provide plenty of free space around the antennas. KLM provides color-coded pre-tuned elements that aid in correct placement, but accurately centering each element requires mathematical precision, elbow room, and a bit of patience.

The 2M-14C requires insertion of seven horizontal and seven vertical elements while the 435-40CX relies on two reflectors and 36 directors divided between two planes. We decided that a digital tape measure would ensure accurate placement of the elements, and it proved its worth throughout this phase of the project.

Mounting the antennas above the quad boom was a three-man job! Jerry K4FZY, Scott KS4IN, and Richard manned ladders and strapped on safety belts to steady themselves near the lowered quad boom.

After a weekend of hard work, Richard gave the antennas their first trial run. Once Richard felt assured that the equipment was functioning satisfactorily, he encouraged me to give it a try. I tentatively put on the headphones and called CQ on *OSCAR-10*. A voice bounced back from North Carolina. I was operating a bird! The only difficulty I encountered was manually tuning the frequency at the proper rate to keep up with the Doppler shift. That talent comes with practice.

One year later, in August of 1997, misfortune struck our happy ham shack and brought all amateur activities to a halt. A brief but violent storm toppled the tower. After six years of withstanding more severe weather, the tower had seemed impervious to Mother Nature's extremes. However, after assessing the damage, including twisted antennas and shattered Fiberglas® beams, we concluded that the added weight of the satellite antennas, although not exceeding the manufacturer's recommendations, put a strain on the tower in high winds.

We were back to square one. For-

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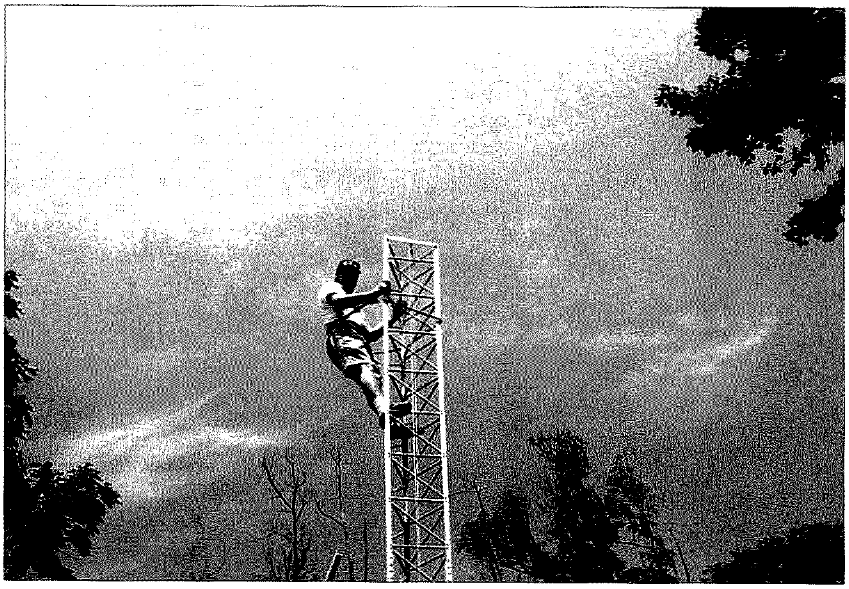

Photo C. Jerry K4FZY admires the project from his bird's-eye view.

Telescoping PVC Mast

Getting it up in awkward places.

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790 West 800 South
Richfield UT 84701
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My family and I camp a lot, and good places to hang up antennas are sometimes hard to find. I decided I needed a mast that was very portable—meaning it had to fit in the bed of my full-sized pickup truck, be at least 20 feet tall when erected, be lightweight, and cost very little for materials. Ease of construction did not enter into my plans—but as it turned out, this is a very easy to build mast.

My first thought was to make it out of metal, but having installed my own sprinkling system, and having built many antennas with PVC pipe and fittings, my thoughts soon were turned to PVC. I wanted my mast to come apart easily, or, in some other way, break down to eight feet in length. A telescoping mast seemed the easiest solution for handling and storage.

After dry-fitting and laying the pipe out on the hardware store floor, I bought the parts for about $20 and went home to try putting my new mast together.

A very important part of the mast is that the reducer bushings must be enlarged slightly so the pipe will slide through it. I used a drum sander in my drill press to enlarge both reducer bushings.

Construction

H in **Fig. 1** on pipe B is a 1/4-inch-diameter hole drilled through both sides of the pipe, 12 inches from the bottom. This is to hold pipe B in place when it is extended out of pipe A. I put a three-inch-long quarter-inch bolt through hole *H* and hole *I* in pipe C.

Fig. 2 shows how all the fittings and pipes go together. I did not cement the fittings to the pipe. They have a taper fit and will hold very well with a little pressure. If you cement them they're stuck forever.

The two-inch coupler *G* presses down on the two-inch pipe A. The two-inch to one-and-one-half-inch reducer *F*, which has been reamed out so that the one-and-one-half-inch pipe will slide through it, fits into the two-inch coupler *G*.

The one-and-one-half-inch coupler *E* presses onto the one-and-one-half-inch pipe B. The one-and-one-half-inch to one-inch reducer *D*, which has been reamed out so that the one-inch pipe C will slide through it, presses into the coupler *E*.

Pipe C has quarter-inch holes *I* drilled at 12-inch locations starting from the top and ending about two feet from the bottom. These are to be used to adjust the height of pipe C.

Pipe B fits into *F* and pipe C fits into

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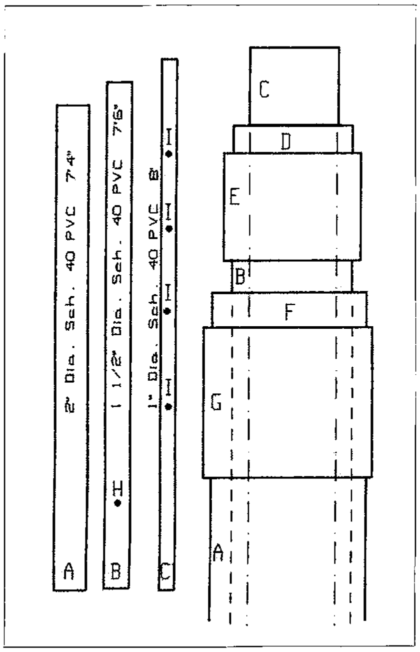

Fig. 1. Lengths. *Fig. 2. The pipes.*

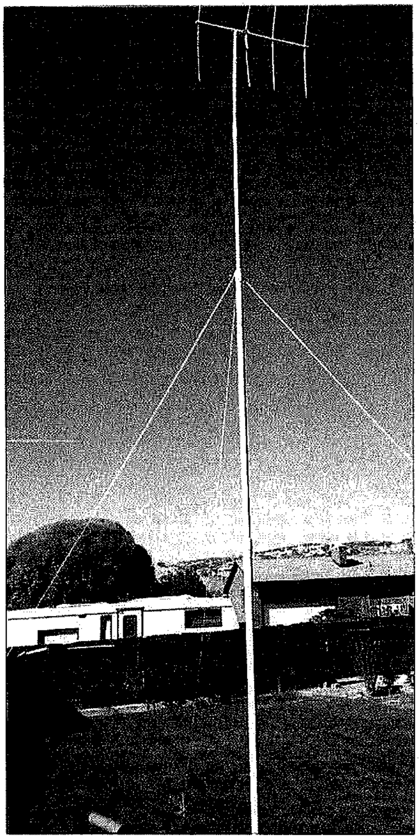

Photo A. Mast with Insta-Flex two-meter yagi beam.

Telescoping PVC Mast

continued from page 35

D. This all slides together to make a nice eight-foot-long collapsed mast. To extend it to 20 feet, pull C out to the bottom quarter-inch hole and insert a bolt through the hole. Let it rest on *D*. Pull B out to the quarter-inch hole *H*, stick a bolt through the hole and let it rest on *F*. I use three nylon ropes as guys; I loop them over C and let them slide down to rest on *D*. Alternatively, they could be made to attach closer to the top of C.

Modifications

Another modification I made later was to place a one-inch wooden dowel inside pipe C for extra strength when supporting heavier antennas. The next modification was to get a one-inch coupler, sand it down so that it would slide inside pipe B, and set it on the bottom of pipe C, to take the slop out of the two pipes. Pipe B in pipe A is a good fit by itself.

Parts List

Qty.	Description
1	7' 4" length 2-inch-diameter s/40 PVC pipe
1	7' 6" length 1-1/2-inch-diameter s/40 PVC pipe
1	8' length 1-inch-diameter s/40 PVC pipe
1	2-inch coupler
1	1-1/2-inch coupler
1	1-inch coupler
1	2-inch to 1-1/2-inch reducer bushing
1	1-1/2-inch to 1-inch reducer bushing
2	1/4-inch bolts, each 3 inches long
1	2-inch cap for bottom of pipe A

Miscellaneous: Nylon™ rope for guys; 1-inch-diameter wooden dowel for extra strength

Table 1. *Parts list for the telescoping PVC mast.*

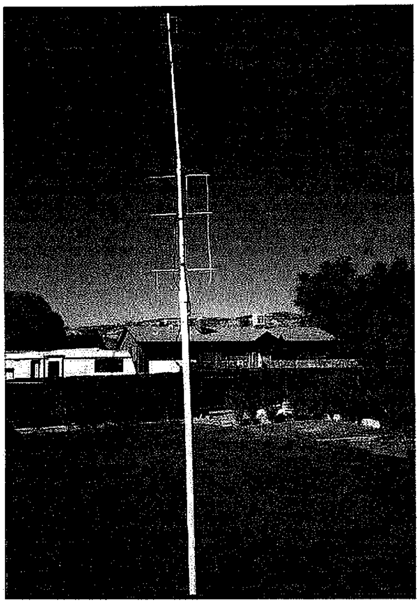

Photo B. *Mast with two-meter and 70 cm top-fed, out-of-phase, phased vertical antenna. Design by Nizar A. Mullani KØNM, from "Top-Fed, Out-of-Phase, Phased-Verticals (TOP) Antenna," published in March 1997's* 73 Amateur Radio Today.

I also have a two-inch cap for the bottom of pipe A. I sanded it out a little so that it will not fit too tightly and it can be taken off. I put the cap on when that mast is placed on the ground, and take it off if I want to install the mast on the two-inch-ball trailer hitch of my pickup truck (or the one on the back of my camp trailer).

Of course, my favorite antenna to set on top of the mast is the "Insta-Flex Two-Meter Yagi Beam" I designed, which was published in the April 1997 issue of *73 Amateur Radio Today* (see **Photo A**). My PVC mast has also supported a 10-meter dipole made of surplus military whips. The latest antennas to grace the top of my mast have been Nizar A. Mullani KØNM's design. They're called the "Top-Fed, Out-of-Phase, Phased-Verticals (TOP) Antenna," and were explained in the March 1997 issue of *73*. I have made both a two-meter and a 440 version of the "TOP"; they are easy to make and work well. (**Photo B**). *N.B. Check out Nizar's article—it's very interesting.*

Euthanasia Keyer Project

Quick and painless.

David Cripe KC3ZQ
RR 2 Box 263
Camp Point IL 62320

Here is a quick keyer project that provides clean, iambic keying for your rig. It uses only three common ICs and can be breadboarded in an evening. It operates from 3 to 15 volts, consumes well less than a milliamp of current, has a speed control, and its dots, dashes and spaces are self-completing. You can't ask for more than that!

The circuit is centered on U3, a CMOS 555 timer used as a pulse generator. (If a regular 555 is used, the speed control resistor must be changed to 5 k, with a corresponding increase in

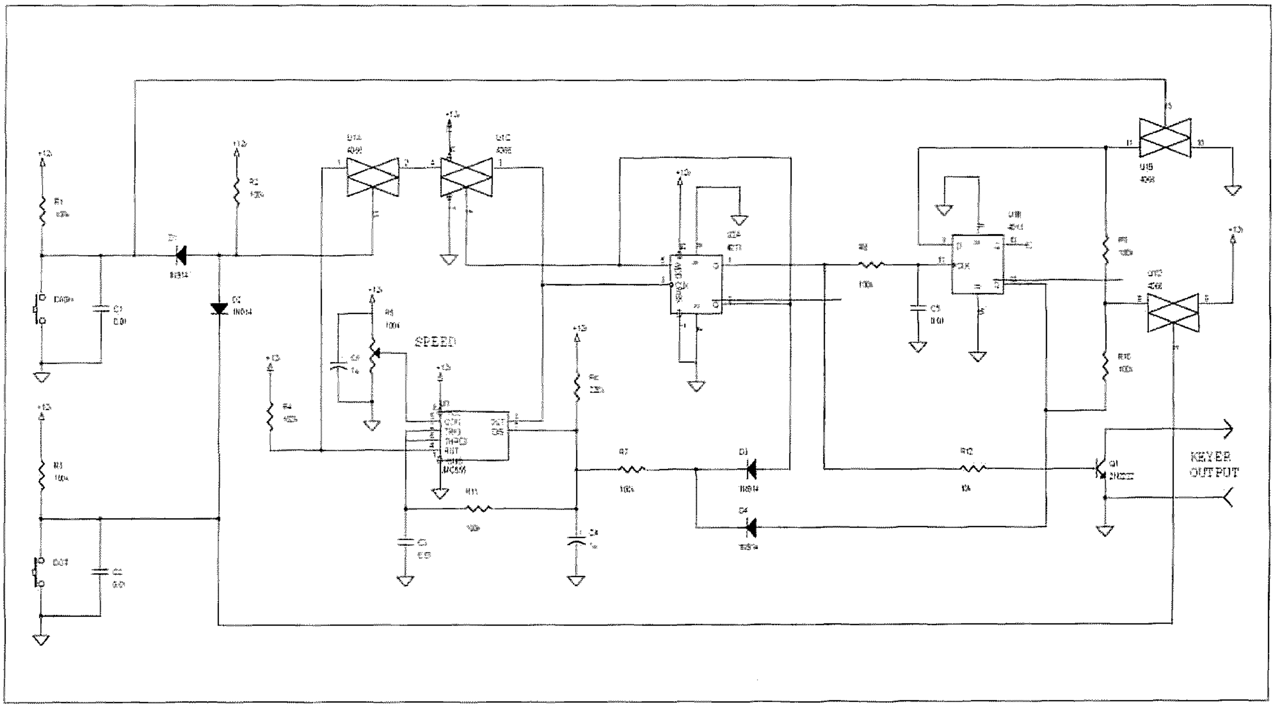

Fig. 1. Schematic.

PARTS LIST	
R1–4, 7–11	100 k
R5	100 k linear pot
R6	220 k
R12	10 k
C1–3, 5	0.01 µF 25 V ceramic
C4, 6	1 µF 16 V electrolytic
D1–4	1N914
Q1	2N2222 or equivalent
U1	4066 quad analog switch
U2	4013 dual flip-flop
U3	LMC555 CMOS timer

Table 1. Parts list.

power consumption.) The pulse generator is activated by the closure of either the dot or dash switch, and continues until the termination of the space at the end of the last character generated.

The pulse stream from the 555 enters U1A, a 4013 flip-flop, where the frequency is divided in half, so that a stream of dots will be separated by spaces of the same width as the dots. The "Q" output of this gate drives the gate of Q1, a 2N2222 transistor that keys the transmitter.

The length of the pulse generated by the 555 controls the length of the dot, dash or space signal. Normally, U3 produces pulses approximately 150 milliseconds in length. But when the anode of either D3 or D4 is held high, the pulse length of U3 is shortened to a nominal 50 milliseconds. This short-pulse condition occurs when either a dot or space is being produced.

Iambic operation (alternating dots and dashes) occurs when both dot and dash switches are pressed. In this condition, U1B drives the anode of D4 alternately high and low with each successive pulse from U1A, causing each keyed pulse to be alternately 50 or 150 milliseconds in length—the ideal one-to-three ratio for dot-to-dash weighting.

For the values shown here, the keyer will operate at nominally 12 WPM. The speed control pot allows the keying rate to be adjusted from roughly 8 to 25 WPM. If a higher or lower keying rate is desired, adjust the value of C4 up or down accordingly—larger values result in slower keying.

The entire circuit can be constructed on a few square inches of perfboard, and installed into a spare corner of your QRP rig. Alternately, you can install it into a dead computer mouse, using the mouse buttons for the keyer paddles. Use your imagination—and enjoy building this project!

My Old Kentucky (Satellite) Home

continued from page 34

tunately, our homeowner's insurance covered the damage, and Richard and Scott were soon in the midst of constructing a new tower and antennas. Today, the new cubical quad and satellite antennas continue to provide enjoyable QSOs, but to prevent further catastrophes, we now lower the antennas whenever there's a possibility of storms.

Some of the older amateur satellites are facing their ultimate demise as they approach the earth's atmosphere, and working those satellites while they are still operable brings the privilege of logging contacts on birds that will soon be just a fond memory.

Newer satellites make up for this loss by orbiting the earth with varying "footprints" or signal coverage on land, providing unusual opportunities for QSOs. Other satellites are in the planning or construction stages. Each generation of amateur radio satellites reflects the latest technology, helping to establish radio amateurs firmly in the ranks of producers of reliable space communications.

However, for the majority of hams who do not have the technical aptitudes or opportunities needed for satellite design and construction, the real challenge lies in building tracking antennas that work within the terrestrial restrictions of back yards. That, and picking up the correct end of the soldering iron!

QRX

continued from page 8

keyboard-to-keyboard mode, PSK31, could provide an attractive alternative to CW. This technology provides the ability to have keyboard-to-keyboard QSOs with a narrow bandwidth and robust noise immunity on all bands. It does require some typing skill.

For anybody who might be interested in learning about this mode of operation, information about it can be found at [http://aintel.bi.ehu.es/psk31.html].

Thnx to Ron Waxman W9KNB, in The North Shore (MA) Radio Club's *Transmitter*, March 9, 1999.

New DXCC Entity

Effective October 1, 1999, Palestine will be added to the DXCC List. E4 will be the recognized prefix. Contacts made with E4 stations after February 1, 1999, will count for this new DXCC entity. Under the DXCC rules, contacts with the deleted entity of Palestine made prior to June 30, 1968, will not count for DXCC credit. The ITU allocated the callsign prefix E4 for use by Palestine in Operational Bulletin No. 685 issued February 1, 1999.

Thnx to the *Cherry Juice*, newsletter of the Cherryland (Traverse City MI) ARC, February 1999.

Code Saves Destroyer!

I was a Navy CTM ordered to the destroyer *USS William M. Wood* (DD-715), in the summer of 1973. It was TAD (Temporary Additional Duty) from my duty station of Rota, Spain, and I was the only CT on board for the three months. All of my equipment on the ship was in an air-conditioned "van" (an aluminum-skinned equipment shelter) tucked away in the old DASH hangar, and my job was to maintain the gear in working order, doing PMs and repairs when needed.

The *Wood* was so crowded that some of the crew was hot-racking in the berthing spaces. I discovered there were bunks welded three-high on the front starboard side of the hangar, so I made the hangar my home. However, the DASH hangar wasn't really meant to be a living space. The only access I had into the rest of the ship was through a watertight door in the front bulkhead of the hangar, across the open ASROC deck and through another watertight door into the passageway leading to the ship's radio room. During storms I rigged a line from the hangar across the open deck so I wouldn't get knocked overboard when I went below for chow!

The equipment I maintained was mostly a lot of receivers, so I usually spent my days SWLing (short-wave listening), tuned to the ham bands, or copying various RTTY signals. The ship's Operations Officer was also a ham and one of the few people on board with a security clearance to be in the "van." We got on the air a few times in the ham bands using one of the ship's URC-32 HF transceivers.

The ship spent most of that summer going from one Mediterranean port to another, showing the U.S. Navy presence. I was having a heck of a good time!

The USS *Wood* was an old destroyer and was always having problems of one kind or another. We were usually on "water hours" in the hot summer since the fresh-water evaporators could barely keep up with the needs of the ship's boilers, never mind supplying daily showers for the crew!

A time came when we were to participate in a big NATO exercise in the eastern Mediterranean and the *USS Wood* was designated as a "bad guy." Our mission was to shadow the NATO task force, hiding and pretending to be a ship from an enemy navy. When the exercise started, all the other U.S. ships sailed off into the sunset and left us behind.

As luck would have it, at that very moment something went wrong down in the engine room and they "salted the boilers," contaminating the fresh water with sea water. We were dead in the water in a major shipping lane and it was late afternoon. Restoring normal power to the ship was now eight or ten hours away.

This class of destroyers had two emergency generators on board, so we should have had electrical power for navigation lights and communications. However, one generator was down for critical parts (I heard it was a bearing), and the other one wouldn't start! There we were, a U.S. Navy destroyer adrift in a shipping lane with no power, lights, or radios, and no one expecting us to be anywhere soon.

Things started getting a little strange on board. With no ventilation in below-deck spaces and no jobs to do, everyone came up and started hanging around on the weather decks. The reefers were warming up, so cases and cases of ice cream in Dixie cups were being passed up for the crew to eat. It was a race to eat them before everything melted! The empties were tossed over the side, and pretty soon the ship was surrounded by a ten-foot wide belt of floating Dixie cups, paper lids, and little wooden spoons. It was quite a sight.

Well, there *was* one other vessel in the area that day. It was the ever present Soviet ship that shadowed our fleet for real. The Russian destroyer had initially sailed off with the task force, but they must have been curious about the lone tin can staying behind, because they came back to check us out. At about the same time, someone using the 20-power big-eyes on the flying bridge spotted a big, *big* freighter on the horizon heading our way, directly at us.

Our signalmen had some battery-powered flashing lanterns and started "talking" in Morse to the Russians. It was a good thing that we had that language in common! The destroyer circled us a few times, saw the impending doom, and went charging off directly toward the freighter, zigzagging back and forth across her path until someone on the bridge finally changed course to go past us instead of through us! The Russian tin can stayed with us that night until we got our boilers back up.

During the cold-war years a lot of unpleasant things happened between our two navies, but I always think of that Russian destroyer crew guarding us when we were in trouble, regardless of the flags we sailed under.

By Glenn W. Pladsen. Thnx to the *Balanced Modulator*, newsletter of the North Florida Amateur Radio Society, February 1999, from the U.S. Naval Cryptological Veterans Assn., via WB2FGL. Originally printed in the *World Wireless Beacon.*

Anyone else out there have any hamming "war stories"? — ed.

DNA Conducts Electricity

A pair of Swiss scientists say that it may be possible to grow parts for future high speed computers because of their discovery that DNA is actually an efficient semiconductor. As a result, Hans-Werner Fink and Christian Schoenenberger of the University of Basel say that DNA might someday be used to replace wires in computers, chips, and transistors.

The two scientists have been working on this research for several years. The results of their study suggest that DNA conducts electricity as well as any other known semiconductor. They say that if DNA strands could be genetically engineered with a switch to turn the current flowing through them on and off, they could be used to build extremely tiny electrical devices that are the basic building blocks of computers and other electronic devices.

Thnx to Mir Sholom Science News, via *Newsline*, Bill Pasternak WA6ITF, editor.

War of the Worlds

Call it life imitating art last year. When a Portuguese radio station decided to repeat Orson Welles' famous *War of the Worlds* broadcast, the results were predictable. Graham Kemp VK4BB of *Q-News* reported on the Martians taking on Lisbon:

... On Friday, October 30th, radio station Antena 3, in Lisbon, celebrated the 60th anniversary of the Orson Welles radio drama *War of the Worlds* by rebroadcasting it during the morning show.

The original Welles script was used and translated into Portuguese. The station issued a warning at 7 a.m., announcing their intention to broadcast the radio play. But when the play began an hour later at 8 a.m., panic erupted.

The station broadcast the landing of a UFO at Palmela, and the bulletins said that the Martians had set off in the direction of the capital (Lisbon) and that military forces sent to stop them had proved powerless.

The program's producer said the radio station was inundated with calls from hundreds of panicking people demanding to know what was going on.

The 7 a.m. warning proved worthless because not everyone is listening to the radio that early. Some callers said they had fled their workplaces. Others with health problems complained that their health had deteriorated on news of the Martian invasion.

One of the organizers of the broadcast said, "One hundred years after the invention of the radio, there are still people who will believe anything." ...

All this goes to prove that even sixty years later, some people in radio just never seem to learn.

Tnx and a "run for your life!" to *Q-News*, courtesy of *Newsline*, Bill Pasternak WA6ITF, editor.

Number 40 on your Feedback card

Above & Beyond

VHF and Above Operation

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Microwave power meters: Operation and testing

Well, we have covered the power meter and its thermistor detector head, the most popular detector used today. There have been many discussions about trying to determine what is the best test equipment for what bargain price. Considering the sheer number of devices out there in surplus, the thermistor RF power head and its associated meter seem to take the top slots for reasonably good buys in surplus when compared with other types of instruments.

Yes, there are other types of meters besides thermistor RF power meters. That's the topic of this month's column, continuing on a few facets of power meters and their attributes.

Most all of us have at one time or another come upon a difficult measurement to be made with a power meter. This is usually the case when the readings require the lowest scales of the thermistor power meter to be employed. It seems that at least sometimes the thermistor becomes obstinate about giving up a true reading at these low scale power levels. Usually it's not a big problem, but trouble or questions arise about the accuracy of readings taken when the power level is quite low — say, in the -20 or so dB range.

No matter which manufacturer's thermistor meter you use, they all seem to drift at these low power measurement settings. What is going on and what can be done to improve measurement capability? First, let's see what is most likely to be obtained in surplus.

Most power meters available to the amateur are from Hewlett Packard or General Microwave. It seems that these two workhorses were used in greater quantity (at least in my area of the US) than other types of power meters. In California, I have observed many HP-431 power meters at swapmeets, along with their counterparts, the General Microwave meters. The only thing sticky in picking up a meter is the availability of the critical components, the thermistor power detector head and attaching cable.

Here the General Microwave meters seem to have the edge, as lots of heads came with cables attached permanently. Lots of these RF heads have appeared at swapmeets but it seems that most are defective, having been blown by subjection of the sensitive thermistor power meter head to much greater RF power, thereby smoking the device.

Why you are generally less likely to find a good General Microwave head seems to be related to their sheer size — they are bigger than the HP heads. I don't know what the reason is, but only project a simple answer to support what I have observed. That observation seems to support the HP thermistor head as more prevalent and therefore easier to obtain in surplus. Sure there are indeed defective power meter heads in the HP surplus at swapmeets, so everything still needs to be tested with a simple ohmmeter test to see if it is alive.

The two thermistors should measure about 2 to 3 k ohms and should be matched in resistance between each other to less than 10% difference. The HP power meter requires them to be matched to balance the bridge circuit internal to the power meter. Most cords required to connect the RF head to the meter have always tested good. Usually the cords are about 3 feet long; while other longer ones exist, they require some special attention for calibration to a power meter normally used with a three foot cord.

OK, now you have received an HP-431 power meter and cable RF head and connected everything all together and have started calibrating the unit. Calibration consists of zeroing the power meter on the zero dB range with the coarse and fine balance control, and then slightly unbalancing with the fine balance control to read slightly up-scale. Switch to the null range and adjust the null capacitor for minimum meter reading. Go back and balance with the fine balance control to zero meter reading, and you're done. Power can be read on any scale.

If you have an HP-432 power meter the procedure is quite similar, except that there is only a coarse meter balance to be adjusted to the zero meter reading. Going to other ranges to make measurements, if the meter is off zero adjust, activate the "set" toggle switch on the meter face and the meter will automatically be adjusted to zero.

Well, not so, you say, having done this several times, waited, and still seen the meter seem to climb up-scale in meter readings while you just sat there with no RF applied. What is going on? Do I have a drifty, defective meter? That's the topic of this month's column, to answer questions sent in by readers about their power meters and about just this exact scenario of drifting power meter readings, especially on the lower power meter ranges.

The analysis is such that the meter behaves at the zero dB range and slightly poorer on the minus 10 dB range and gets even worse on the minus 20 dBm range. Well, is this a defective meter to be replaced? What is going on to make the meter so unstable? Let's look into the meter's operation and see how the thermistors allow RF power to be measured and displayed on the analog meter of the power meter.

Thermistors are heat sensitive devices and, as the name implies, are actually temperature controlled resistors. In other words, they respond to minute changes in temperature to cause a bridge circuit to be upset. This upset or imbalance caused by components changing their resistance is how the power meter works. The thermistor is in one leg of a bridge balance circuit and the meter is in the other leg. When one leg unbalances, it causes the other leg to react. The change is indicated on the analog meter and shows how unbalanced it is. The more the power that is applied to one side, the more the meter swing on the other bridge lead and thus the indication of more RF power as a whole test set.

In practice, RF is applied to one thermistor while the second thermistor in the power meter head (not exposed to RF heating) is supposed to balance external heating effects (room temperature changes) to develop a true RF power reading. The second thermistor is used to stabilize small temperature changes to make RF readings more accurate.

On the upper meter scales, this is quite true and very sensitive. But when you go to the lower limits, the thermistors are not able to control minor temperature changes and retain a zero meter reading. If you don't believe me, calibrate the meter and set it to the minus 20 dB range on zero and touch the RF head with your (warm) hand. The meter will go steadily upscale as the thermistors change their resistance, reacting to the temperature change from your hand. It's not RF, but body heat.

Simple drafts of air in a garage or home environment will do the same thing with slightly longer time constants. How, then, do you make low power

meter readings that are accurate? Well, calibrate your meter and take a quick measurement, then terminate the test and see how much the meter is now uncalibrated — then make a quicker test or make a judgment call on the results.

Can the measurement be made with better accuracy? You bet it can, but not with standard thermistor mount devices. The power meter principle can be used, but the method is changed. What you do is remove the thermistor-type meter from very low power measurements and replace it with a crystal detector-type power meter.

In my shack, I have an old surplus Pacific Measurements crystal detector power meter. So far this is the only crystal detector power meter that I have seen for a reasonable price on the surplus market. Sure, I have seen others offered for sale, but I was not willing to pay the asking price. Maybe I was lucky in that a local surplus dealer had this meter and it came with the detector attached. Not only was the price reasonable, but testing the meter showed that it seemed to be functional. A little contact cleaner sprayed into the pots and switches for better electrical contacts reclaimed a very effective meter.

This meter has a particular quirk in that it requires a warm-up for internal circuitry of about 2 to 5 minutes, during which time it's useless to try to use the meter — it just wants to self-balance or go through some process that I am not familiar with (I do not have a manual). After this period of time, the crystal detector can be attached to an onboard 30 MHz RF very accurate test source at zero dBm for meter calibration. This source is also switchable to minus 20 dBm to balance the meter using these two test levels.

After that, the meter is accurate down to nearly minus 70 dBm and does not drift even when handled (body heat), as heat does not affect the results of the power meter head. Why? Because this responds to detected RF being rectified in the diode and its reading presented to the meter's sensitive circuitry. RF in this case does not heat the thermistor to change its resistance. The diode detector meter produces so much of an improvement in dynamic range that I can use the meter to evaluate filters and other devices requiring very low levels. Things like a filter that is not in adjustment exhibit very high loss and, even when driven with a +10 dBm from a signal generator, losses can exceed 50 dB when out of resonance.

The crystal detector seems to be quite an improvement over thermistors. The Pacific Measurements power meter with diode detector has made a great impression on me in many ways. First, by extending lower sensitivity better than 30 dB over that which can be obtained with the thermistor mounts. Second, the frequency response is greatly improved and seems to be quite a wide range, from 10 MHz or so to 18 GHz. Tests at 24 GHz are unconfirmed, as I have nothing to verify them with, but it still sees 24 GHz energy and gives me a reading that seems somewhat down in level but still very workable. (I do not have any 24 GHz source that can be used to verify results at this frequency.)

Have I gone overboard to the point at which I use only the crystal detector RF power meter? No, for several reasons. The HP-432 power meter is the workhorse meter in my shack and will remain so for quite some time. It is sensitive for most all work repairs and adjustments made on my bench, and if for some reason it goes kaput I have spare meters and power meter heads in order to quickly get back into the business at hand. I would cry losing an HP power meter head, but there are spares.

With regard to the Pacific Measurements crystal power meter, I would *really* cry if I blew this unit up. I do not have spare crystal detector heads. The other stuff comprising the power meter circuitry can be repaired, as it is discrete circuitry. It would not be easy, but it is possible to repair most all of it. While some components might be special, almost all the parts can be obtained. So my main advice is to protect the power meter crystal detector from all accidental overloads; in other words, reserve it for tests that cannot damage the crystal detector. If you must, use attenuators to protect the meter at all costs.

That's the main reason I reserve the crystal detector for low level tests rather than use a 30 dB attenuator and measure 10 watts of power from a TWT amplifier. Should the attenuator let go and go bad, there goes the crystal detector and the power meter, without a repair part. Should the HP power meter be subjected to the same scenario of destruction at high meltdown proportions (the TWT amplifier), there are spare power meter heads available in my shack. I would recommend the same to you should you have the opportunity of acquiring spare equipment for "that day."

My recommendations made concerning diode detector power meter heads would seem to extend to products from other manufacturers of power meters, not just the one I happen to have in my shack. The Pacific Measurements crystal power meter was picked up through surplus, and as such just happened to be the first one of its type I was able to locate.

The winds of surplus blow hot and cold for all kinds of instruments. I hope you are able to take advantage of using a crystal detector power meter, with its greater dynamic measurement range in comparison with conventional thermistor power meters.

Well, that's it for this month. If you have any questions on this month's topic or related subjects, please feel free to drop me a line (please send an SASE), or still better yet, send me an E-mail note for a fast response at [clhough@pacbell.net]. 73, Chuck WB6IGP.

Number 42 on your Feedback card

HAMSATS

Amateur Radio Via Satellites

Andy MacAllister W5ACM
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Houston TX 77083

On February 23, 1999, at 2:29 a.m. Pacific Standard time, a Boeing Delta II rocket flawlessly lifted three satellites into a 450-nautical-mile-high orbit from Vandenberg Air Force Base. The primary payload was the 6,000-pound P91-1 Advanced Research and Global Observation Satellite (ARGOS) for the U.S. Air Force. Secondary payloads included the Orsted satellite for Denmark and SUNSAT-1 for South Africa. The launch was originally scheduled for early January, but weather and mechanical problems caused at least 10 delays.

The Delta II launcher

Amateur-radio satellites have a long history with flights from Vandenberg and Delta rockets. OSCAR-1 (Orbiting Satellite Carrying Amateur Radio) was the first hamsat to reach orbit from Vandenberg. The rocket was a Thor Agena and the date was December 12, 1961. Australis-OSCAR-5 was the first hamsat on a Delta rocket. Launch was from Vandenberg on January 23, 1970.

While most recent hamsats have been carried to orbit on Ariane vehicles, SUNSAT-1 (now known as SUNSAT-OSCAR-35), Orsted, and ARGOS rode a Boeing Delta II 7920-10. It is the current standard for a medium capacity expendable launch vehicle. The basic structure is manufactured in Huntington Beach, California. The engine is an RS-27A built by the Rocketdyne Division of Boeing in Canoga Park, California. This engine uses a combination of liquid oxygen and RP-1 (kerosene), and has a liftoff thrust of 200,000 foot pounds. Final assembly for Delta rockets is in Pueblo, Colorado. The Delta launch team at Vandenberg AFB handles launch coordination and operations.

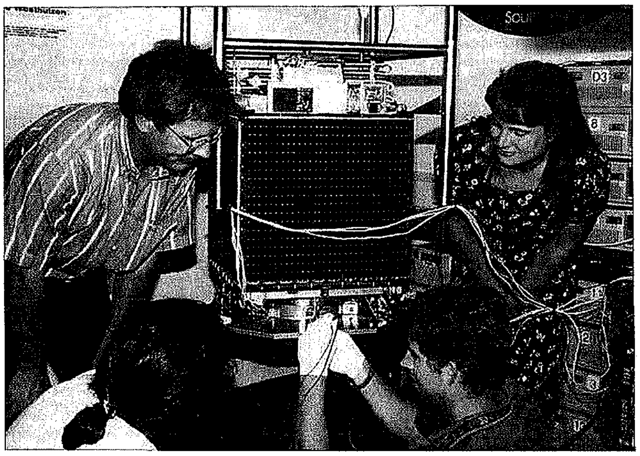

Photo B. SUNSAT and some of the crew at the University of Stellenbosch in South Africa. (This and succeeding photos courtesy of SA AMSAT.)

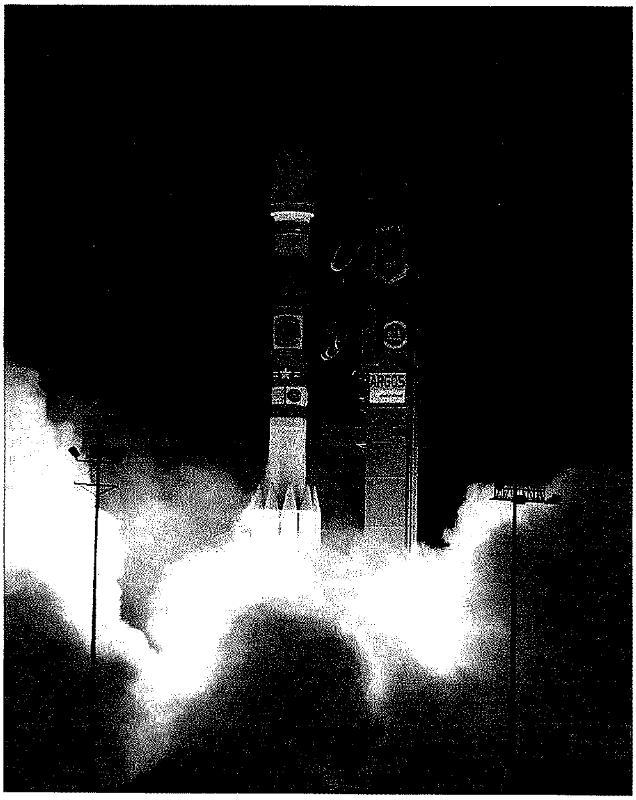

Photo A. SUNSAT-OSCAR-35 (SO-35) headed for orbit from Vandenberg AFB with ARGOS (USAF) and Orsted (Denmark) onboard a Boeing Delta II rocket on February 23, 1999. (Thom Baur photo via Boeing.)

ARGOS

At three tons, the ARGOS satellite carries nine separate subsystems to demonstrate future satellite technology and conduct various high-technology experiments. As the primary contractor, Boeing integrated the sub-payloads and developed the overall design. The solar-cell panels deliver 2200 watts of power and the data transfer rate from the satellite to Earth can run up to five megabits per second, more than twice that of current comparable satellites.

The nine major experiments onboard ARGOS address more than 30 research objectives, including sensor technology tests for the International Space Station (ISS), three ultraviolet imaging experiments, and an X-ray sensor system to observe X-ray pulsars. Other devices include a high-temperature super-conducting

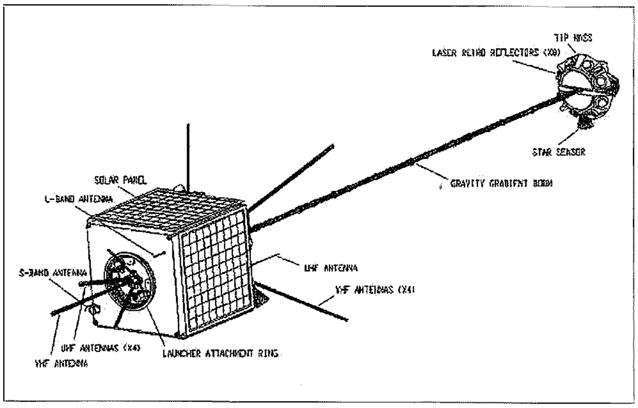

Fig. 1. SUNSAT 1 (SUNSAT-OSCAR-35) in its operational configuration with gravity gradient boom deployed. (This and other figures courtesy of SA AMSAT.)

Photo C. *Dirk Merwe and Kobus Westhuizen installing the Payload Adapter Assembly (PAA) on SUNSAT.*

experiment, an arc-jet thruster rocket and a Global Positioning System (GPS) receiver. ARGOS has a three-year design life.

ORSTED

Both Orsted and SO-35 are very small satellites compared with ARGOS. Each weighs just a bit more than 100 pounds. They were mounted below and to the sides of the ARGOS Payload Attach Fitting and released from the second stage booster about 50 minutes after ARGOS.

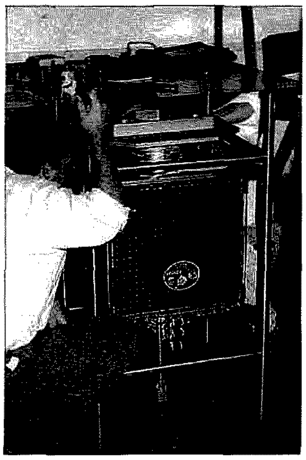

Photo D. *In the lab at the University of Stellenbosch, SUNSAT gets a fit check with the Payload Adapter Assembly (PAA) and associated hardware.*

Orsted was designed to study the generation of Earth's magnetic and electrical fields. NASA-supplied components include a GPS receiver and a magnetometer. The satellite is appropriately named after Hans Christian Oersted (1777–1851). He was a professor of physics at the University of Copenhagen. Nearly 180 years ago, he was the first to note that a compass needle is deflected when a current is applied to a nearby wire.

SUNSAT beginnings

In 1989, at a conference hosted by the University of Stellenbosch in South Africa, a proposal was made to build and launch a satellite. The suggested program name was KLEINSAT (*klein* is the Afrikaans word for small). After nearly a year and a half of work defining the program and attracting industry sponsors, an advisory board was set up and an official program began under the name SUNSAT in June, 1991.

Prof. Garth Milne ZR1AFH was named as Project Leader and Hans van de Groenendaal ZS5AKV, representing AMSAT-SA (The Radio Amateur Satellite Corporation of South Africa) and the South African Radio League, was named to the advisory board. The name SUNSAT is derived from Stellenbosch UNiversity SATellite. Partners in the program include Alcatel Altech Telecoms, Siemens and Plessey SA and the Foundation for Research and Development.

The primary payload

The SUNSAT program defined the satellite's primary payload as a low-cost, high-resolution imaging system to take photographs of South Africa. The goal is to analyze the spectral content of images sent from SUNSAT to determine the type and density of ground vegetation. The University of Stellenbosch worked with the South African Council for Scientific and Industrial Research to develop a three-color (green, red, and infrared) camera system that has a resolution of about 50 feet from an altitude of 450 miles. A similar camera is in development for use on the hamsat KITSAT-3 from South Korea.

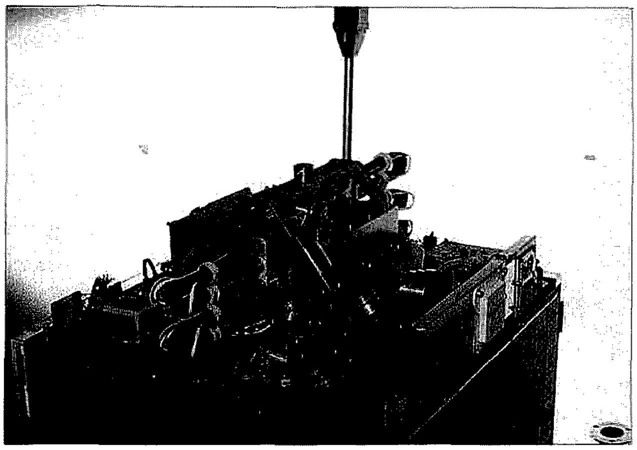

Photo E. *A top view of the SUNSAT spacecraft reveals several devices and instruments, including a star camera (front center), a white GPS patch antenna (right), and the tubular sections of an 8-foot-long gravity gradient boom in its pre-release state (center).*

Other experiments

Several experiments were designed for inclusion in the SUNSAT spaceframe. They include a satellite sound and temperature device from the George Campbell Technical High School in Durban, South Africa; a radiation damage sensing experiment from the Rhenish Girls High School in Stellenbosch; a dust particle detection unit from the Cape Town Peninsula Technicon; a material exposure

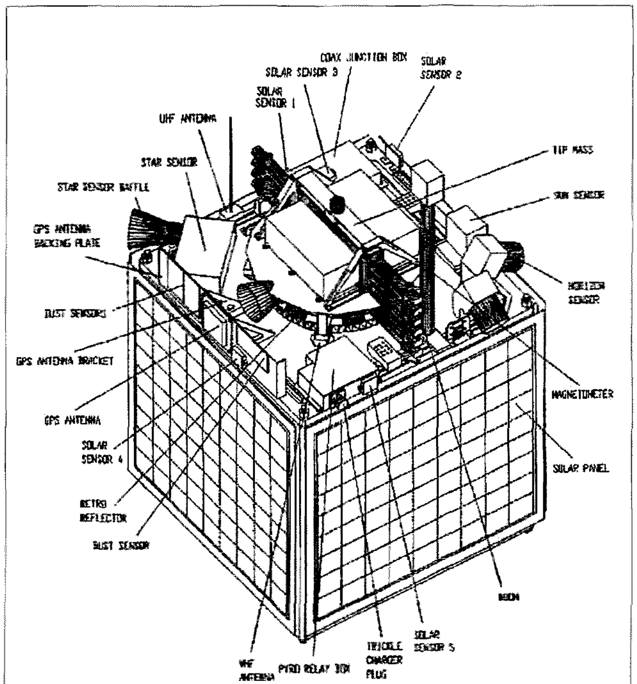

Fig. 2. *View of the instrumentation on the zenith-pointing face of SUNSAT 1.*

experiment from the Materials Science Department of the University of Kebangsaan in Malaysia; a TV camera with S-band (13-cm) downlink; and two NASA devices.

NASA provided a GPS Turbo-Rogue receiver and a satellite laser tracking retro reflector. The laser reflector system can be used to determine the exact distance (millimeter accuracy) from a ground tracking station using a high-power laser to the satellite by measuring the transit time for the light beam.

The ham gear

SO-35 carries a number of systems of interest to radio amateurs. The basic gear includes a two-meter FM parrot repeater on 145.825 MHz, and a digital store-and-forward packet package capable of 1200 or 9600 baud operation, along with other FM transponder possibilities.

The parrot repeater listens for eight seconds and then transmits what it has heard and recorded during the next eight-second cycle. The operation is repeated as long as the unit is activated. This rudimentary system was developed to allow very simple ground stations access to the satellite. It is hoped that school ham stations will be able to easily use this resource to promote space science education.

SO-35 downlink frequencies include 145.825, 436.300, and 436.250 MHz. During the first days after launch, the 436.250 MHz frequency was used for 1200-baud telemetry downlink.

Due to the flexibility of the system, nearby frequencies can be programmed into the satellite in 12.5 kHz increments. Power output for the downlinks can be set to one or four watts on two meters and 1.5 or 10 watts on 70 cm. The low power settings will be in effect over most of the world, while the high-power settings will be used when the satellite is over Africa. Amateur radio operators and school groups will need to request high-power operation over their areas for specific experiments or events. E-mail to [hans@intekom.co.za] should work.

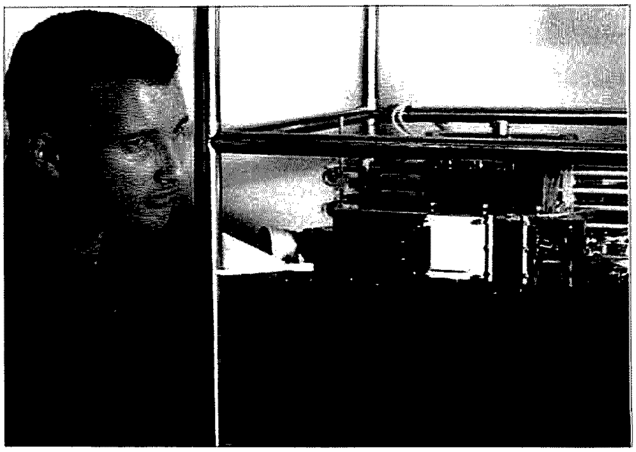

Photo F. Zaahied Cassim of the Peninsula Technicon checks out his particle impact detectors on SUNSAT.

SO-35's FM uplinks are also programmable for 12.5 kHz steps, but the primary frequencies include 145.825, 145.850, 145.900, 145.950, 436.300, and 436.250 MHz.

On March 14th, just a few weeks after launch, Garth ZR1AFH in Stellenbosch and Hans ZS5AKV in Hillcrest made a voice contact via SO-35. This was an exciting moment for both, since they had been working to get SUNSAT built and into orbit for nearly a decade. For their historic contact, the satellite was configured for analog FM input on two meters and output on 70 cm, similar to the FM-repeater mode that is enjoyed by many on AMRAD-OSCAR-27. Now that SO-35 is in orbit and operational, the SUNSAT advisory committee will work to finalize a schedule for the satellite's experiments and communications systems.

What's next

Nearly 50 students at the University of Stellenbosch have earned their Master of Electrical Engineering Degrees as a result of working on the SUNSAT project. Efforts are already underway to continue the SUN-

Continued on page 45

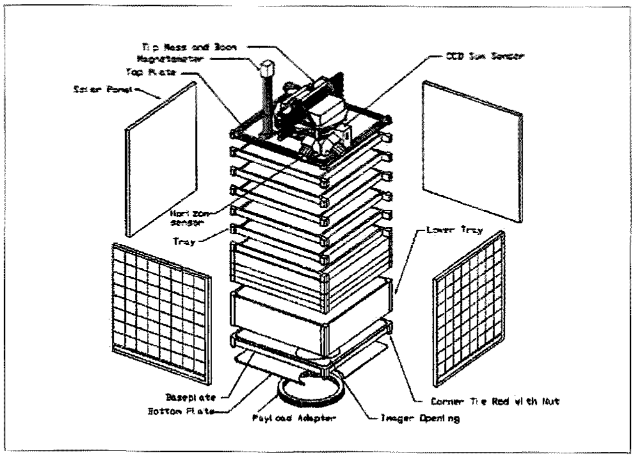

Fig. 3. Exploded view of the structural configuration of SUNSAT I (SO-35).

Number 45 on your Feedback card

HOMING IN

Radio Direction Finding

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Grungebusters

When I first got my ham license as a pre-teen baby-boomer, just about the only sources of RF in my town of 12,000 souls were one AM radio station, a dozen ham operators, and a growing number of CBers. Oh, yes: The police and fire departments had a few radios, too. At an ever-increasing rate, others discovered the usefulness of radio communications — others such as the Post Office, security companies, and utility fleet dispatchers. Then came paging, cell phones, trunked radio systems, medical telemetry, Family Radio Service, and so on.

Nowadays, the ether is full of voice, data, images, telecommands, position reports, and alarms. It seems as if some new use for the spectrum is announced every day. And then there are the devices that aren't supposed to radiate RF, but do, such as computers, arcing doorbell transformers, fish tank heaters, and even light bulbs.

If you haven't experienced interference to your ham operations from one of these sources, you're really lucky. You can't expect your luck to last. The more you know about radio direction finding (RDF) techniques, the faster you'll be able to solve the problems when they occur.

RACES to the rescue

County of Orange RACES in California has more than its share of good transmitter hunters with lots of experience. One of them is Chief Radio Officer Ray Grimes W6RYS. As a Senior Staff Engineer for Motorola, he is often called upon to identify interference to his company's communications products and systems.

"I troubleshoot problems that are high visibility," Ray told me. "If we've got a big police department with communications trouble, or if a big utility comes to Motorola needing help, or if it's a life-threatening matter because a radio system is compromised, I get the call. The company has been very good at letting me deal with things like this. On rare occasions I have been pulled off to places like New York."

What gear does a professional QRM-tracker use?

"I have an IFR service monitor and spectrum analyzer that I carry along," W6RYS explained. "It fits under an airline seat and can demodulate most modes, so I take it everywhere. I also have a couple of high-quality scanners, handhelds and yagis, and some other tricks. I've found a lot of sources in tight areas without a directional antenna, just by using a whip and tightening the squelch. We had to chase some interference in Terminal 1 of Los Angeles Airport on the day after Thanksgiving, starting with the yagis, analyzers and other big stuff. I suddenly realized that we looked too much like the bomb squad and people were starting to notice. So I went out at lunch and bought an inexpensive scanner with a rubber whip. That was enough to eventually sniff out the interference.

"I have a good working relationship with Jim Zoulek and the other Los Angeles FCC folks. They have been very responsive when I need access somewhere. Occasionally, they have helped with RDF. They look up file histories and frequencies for us, but much of the time the emitters are unlicensed and nobody is responsible for them. Look where computers are going, their clocks are getting close to 400 MHz. I've seen interference from laptops tearing up 800 MHz radios. Cable TV channel frequencies are getting higher and leakage is worsening as cable systems get older. Wireless LANs are tearing up the 800 MHz band."

Many times, the offending transmitters are either fully licensed or operating legally within FCC Part 15 specifications. Ray continued, "A number of years ago, we had a security system on high band at a racetrack that was being ripped up by some big AC-modulated carrier. It took us about a half day to find it at a hospital a quarter mile away. Because I got a cop to come over, the hospital's person in charge was very interested.

"He took us up to an ICU ward, where we tracked it to the door of one patient's room. Its window faced the racetrack. Because there was an isolation sign on the door, the nurse went in by herself. She came out holding a medical monitor transmitter in her gloved hands. I asked her to take the battery out of it. She did and the problem went away. Out of curiosity, I asked what the patient was in for. She looked at the chart and said, 'AIDS and hepatitis.' We all immediately took six steps backwards."

Harbor high jinks

In his off hours, Ray works with other OCRACES members to solve QRM problems that have much less visibility, but are just as troublesome to those affected by them. Last fall, these grungebusters needed everything in their bag of tricks to find the source of an interference problem at the Harbor Patrol station in Newport Beach. A strong, continuous signal was present on two important communications frequencies near 45 MHz.

The signal had a strong 60 Hz buzz to it. To them, it sounded like a video carrier. It was also rather unstable in frequency, occupying a 2 MHz swath of spectrum. Harbor Patrol radios do not use subaudible tone squelch, so the interference kept the receivers unsquelched and covered many incoming signals.

W6RYS was first to drive around the harbor vicinity to do some basic listening on a weekday. Early on, he found what appeared to be a stronger version of the interference a few miles northwest, near a large 355-bed hospital. Based on that report, the hospital became the first suspect.

Robert Barris KD6IFZ (OCRACES Direction Finding Coordinator) and Jim Carter WB6HAG each passed through the Newport Harbor area several times on the following weekend, using scanners and other receivers to try to pick up either signal. No luck — The interference was not audible. Where did it go? Perhaps the interference was from a device that only operated during the week. That reinforced the hospital hypothesis.

All this was dispelled by a visit on Monday to the Harbor

HAMSATS

continued from page 44

SAT program with SUNSAT-2 and beyond.

You can find out more about SO-35 via the following Internet Web sites: [http://www.amsat.org] and [http://sunsat.ee.sun.ac.za]. In addition to timely updates on SO-35, both sites offer a number of excellent links to related hamsat pages. The SUNSAT page also provides links to the P91-1 ARGOS, Orsted and SUNSAT media kit from Boeing.

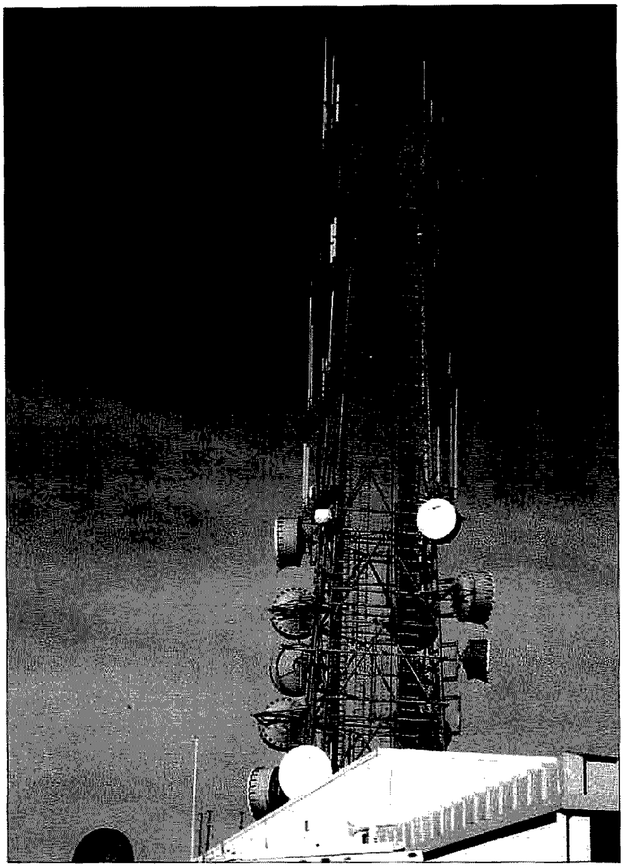

Photo A. *Transmitters everywhere! With all the communications sites like this one, plus RF-emitting devices in almost every home and business, it's no wonder that unintentional interference is a growing problem.*

Patrol building, at which time W6RYS and KD6IFZ were informed that the noise had been nonstop all weekend. "As it turned out," Robert commented, "this should have been an excellent clue that the noise source was either close to the station or inside it, but like many such observations, it only became obvious later."

All three hunters spent a fair amount of time that afternoon both inside and outside the Harbor Patrol building, trying to further characterize the signal, determine if the source was inside or outside, and find out if switching off any particular piece of equipment affected the offending signal.

Trying to nail down a signal source inside an active communications center can be very challenging. Using scanners, a spectrum analyzer, a Tektronix scope and a variety of hand-held radios and attenuators, the OCRACES RDF team went through many possibilities and turned off a lot of equipment, yet the problem persisted. The assortment of digital and radio gear in the room that also radiated noise in the same part of the spectrum made it impossible to home in on the problem signal. Every piece of wire seemed to be awash in this wideband 45 MHz RF.

The scope showed very peculiar modulation. While there was clearly a 60 Hz component to it that was audible, the signal also contained very high frequency "spiky" energy and asymmetry of modulation. Was it video? Corrupted AC power? Computer noise?

The team next went outside to have a listen in the area surrounding the antenna tower. Atop the garage adjoining the main building, Ray and Robert had no problem picking up the signal on their hand-held radios. That made them suspect that the signal source was outdoors, but there was still the possibility that it was inside the building and radiating out through the coax feeds going up to the tower next to the garage.

Further sniffing led them to the other end of the building, where the signal was stronger. There on the rooftop was a long run of coax connected to a dockside security camera. Video, 60 Hz, long cable run near the antenna tower — it all seemed to make perfect sense. They asked when the camera had been installed, and were told a month ago, which correlated with the start of the reported interference. With big grins on their faces, they asked for the camera to be turned off. Their grins vanished just as quickly when the noise persisted on the console radios.

The team mulled over the idea of powering down the whole building for a few seconds to make a fast "inside or outside" determination, but this was rejected as impractical. In hindsight, considering how well the signal propagated through all the cabling, it might not have yielded the right answer anyway.

Then came the news that would add a few more hours in the hot sun. Another Harbor Patrol station down the coast reported hearing the same kind of interference. Aha! The source had to be fairly strong and located somewhere that could reach both Newport Beach and Dana Point!

With radios, maps, and a 45 MHz whip on the trunk lid, W6RYS and KD6IFZ set off on the biggest wild goose chase of the day. After a complete round trip on Pacific Coast Highway to Dana Point and back, they realized that the Dana Point report had been a red herring. Whatever the Dana Point station heard might have had a 60 Hz buzz to it, but there was certainly no signal source between the two sites that could be the culprit. And the second station had nowhere near the QRM level that Newport Beach did.

Now it was getting late in the day and the team needed some results fast. Returning to the Newport Harbor station, they went back to the "nearby signal source" hypothesis. To try to get a better handle on the behavior of the signal, they connected the IFR spectrum analyzer directly to the 45 MHz whip antenna. With Ray driving and Robert keeping the IFR from tipping over in the front seat, they canvassed the area immediately surrounding the station.

There were plenty of distinct signals from 39 to 50 MHz with all the hallmarks of the interference source, such as 60 Hz buzz, wideband, steady strength. Uphill from the harbor station, one residence seemed to have the highest radiated strength of all the emissions in the 45 MHz region. Upon contacting the occupant and making introductions, a sweep of the home was conducted, zeroing in on a new digital cable box. It was giving off the 45.674 MHz signal that the team had picked up with the analyzer in the street.

This signal was coming from every run of coax from the sidewalk all the way through the house. The resident indicated that he had used this new digital cable service for about a month, roughly coincident with the onset of noise at the harbor station. Considering that active attenuation was needed in the last 20 feet of sniffing to the cable box, with about 50 dB of attenuation, it seemed clear that this was a red hot suspect.

The RDF team began to believe that either this residence or the entire cable TV system in the area could be responsible for the QRM. It was conjectured that digital cable signals might indeed carry the distinctive 60 Hz buzz due to video's frame rate, and yet not resemble conventional video modulation because of the digital encoding.

Number 47 on your Feedback card

On the Go

Mobile, Portable and Emergency Operation

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Y2K thoughts

Although the people in high technology have been anticipating the effects of the Y2K bug for over a decade, it now is the stuff of which headlines are made. Everyone seems to be aware that some computers will misinterpret the date after December 31, 1999, to be January 1, 1900, rather than the year 2000. Some companies have undertaken massive efforts to correct this problem, while others have pushed the problem behind other more interesting projects.

In case you've been on a DXpedition for the last year, this problem is due to the fact that back in the days when computer memory was extremely expensive, one of the goals of writing computer code was to abbreviate wherever possible. For this reason, years were encoded as two digits only. At the time, programmers never expected that the programs they wrote in the '60s (make that the 1960s) would be around at the turn of the century. Not only are the programs still around, but they have been translated from one computer language to others. Even if the original source code still existed (and it usually doesn't), it would be almost impossible to rewrite. With the original code lost, it is an even bigger challenge.

The problem is complicated by the fact that some computer programs, even if corrected, can be corrupted by interaction with programs that have not been corrected. There are also many "embedded" chips, which are the computer chips that are part of many appliances, automobiles, etc. While many do not track years, and won't be affected, others do and will. Some feel that the embedded chips in the power grid that controls our household electric power may create a problem. There may also be problems with microcomputers controlling traffic signals and some aspects of the communications system.

In any case, there is truly a bipolar reaction to the expected event. Some people expect no problems, while others have developed a fear level that is difficult to explain. To some, this rivals or exceeds the fear of nuclear war in the 1950s. Just as a small cadre of people at that time built fallout shelters and stocked them with food and supplies and predicted dire consequences, some today have taken a similar position. Generators are being sold at a record rate. I'll bet that very few people who have purchased generators have calculated how much fuel they'll need to purchase, store and treat with preservatives in order to operate the generator for more than a few hours. People are stashing away food such as MREs. Those of us who have had the privilege of existing on these know that the initials are often assigned to words much less complimentary than "meal: ready to eat." I recently heard on the news that the companies which make wood stoves for the Amish have been sold out for quite some time. The same story mentioned an individual who purchased a ton of wheat. I wonder if he or she has figured out what to do with a ton of dry wheat.

Where on the continuum between normalcy and pandemonium will the event lie? No one knows. I believe that it is prudent to prepare for the event, but to do so in a realistic manner. I respect fire, but do not have an unreasonable fear. I own smoke detectors and fire extinguishers although I do not panic at the sight of fire. Like fire, I respect the potential for unexpected occurrence. I expect that between today and December 31, 1999, there will be at least one potential emergency event such as a severe storm, brush fires or a search and rescue requirement that will impact me personally. I also plan on some inconveniences when the clock turns past midnight next New Year's Eve. This column can act as a forum for ideas over the next few months to discuss and review the possible implications of the Y2K eventuality and how to deal with them. Maybe like the long awaited appearance of Halley's Comet it will be a mild event, but then again it may be significant.

What are the priorities that we should set? I believe in XYLs and harmonics first (that's women and children first, for you new to the hobby). The first concern each of us must have is for our families. There are a number of basic issues that can be handled easily. The first rule of survival is for water. Water can be easily stored in gallon containers such as milk jugs. Water stored in late December should be potable just in case the water treatment facility in your area experiences difficulty.

Continued on page 50

The next day, Howard Newton N6WOW went to the scene and performed a far more thorough on-foot sniffing expedition, covering both the immediate area of the Harbor Patrol building as well as dockside. There he discovered a battery charger connected to a jet ski, covered by a tarp. At close range, the 45 MHz interference was incredibly strong. Could it be that simple?

Yes, it vanished the instant the charger was unplugged. The owner indicated that he "plumb forgot" about that charger under there. With that simple step, the Harbor Patrol radios were interference-free once again.

As KD6IFZ told me on the phone afterwards, "It was like any other difficult transmitter hunt. You rack your brain all along, but once you find out what it is, everything suddenly makes sense."

Thanks to Robert, Ray, Jim, Howard and the other T-hunters of Orange County RACES for this story, which was originally detailed by KD6IFZ in *NetControl*, the organization's monthly newsletter.

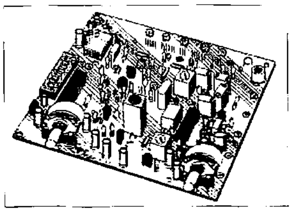
Another kind of snooping

There was a lot of reader interest in the new system for automatically surveying in-car radio listening that I described in "Homing In" for July 1998. Some were excited. ("Can I get a job there?") Others thought it to be a bit snoopy. ("Cookies for radio?")

No worries. The roadside radio detectors compute how many drivers are listening to Rush talk and how many are singing along with Garth, but they make no distinction as to which car is tuned to which star.

The system, called Mobil-Trak, is now operational in Toronto, Phoenix, and some areas of the Los Angeles metropolis. Installation is progressing in a dozen other places, including Miami, Seattle, Kansas City, Nashville, Minneapolis and Pittsburgh. You can read more about it on the Web, following a link you will find at the Homing In site. My site also has the latest on the 1999 ARDF Championships and the Burrowing Owl Project, so check it out if you haven't surfed by for a while.

New Products

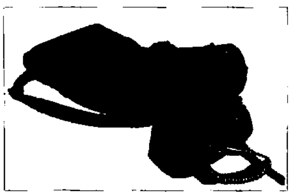


Hamtronics UHF Exciters and Receivers

Hamtronics' UHF exciters and receivers are now available, providing high quality NBFM and FSK operation for UHF ham bands in the 420–450 MHz range and for adjacent bands from 400–470 MHz for export and government services. Features include dip switch frequency selection, low phase noise synthesizer for applications such as repeaters, commercial grade TCXO for tight frequency accuracy in a wide range of environmental conditions, and fast delivery with no wait for channel crystals. The T304 and R304 are available either in kit form or factory wired and tested: the T304 for $149 and $189 respectively; the R304, for $179 and $209. All units include a TCXO as standard equipment, so there is no wait for channel crystals. Contact Hamtronics through [www.hamtronics.com] or at 65-D Moul Rd., Hilton NY 14468-9535; tel. (716) 392-9430.

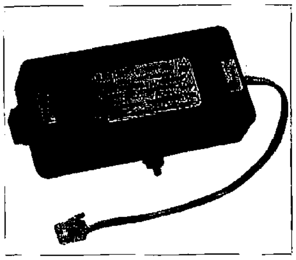
ICOM IC-706MKIIG

This new rig carries on the 706 series' tradition of base station versatility and performance in a mobile-rig-size package. All-mode operation (SSB, CW, RTTY, AM, and FM) is possible, with a full 100 W of output power available for HF and 6m; 50 W for 2m; and 20 W for 70cm. The 706MKIIG also has an automatic repeater function and provides CTCSS encode/decode as well as DSP capabilities. Contact ICOM America at 2380 116th Ave. NE, Bellevue WA 98004; tel. (425) 450-6088; [www.icomamerica.com].



Cutting Edge's World Pack™

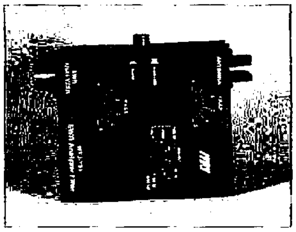
Cutting Edge Enterprises has come up with a backpack that puts new, trademarked meaning into carrying the weight of the world on your shoulders. This rugged pack is made of handsome laminated HD black nylon, with 1/4-inch foam padding. The upper compartment holds your IC-706 or FT-100 or other mobile HF rig, while the lower space can be used for a rechargeable battery power supply (also available). We understand that this pack is small enough to qualify for airline carry-on luggage, complete enough to serve as an entire station, and comfortable enough to carry for miles. CQ vacationers! The World Pack itself sells for $57.95, while the Cutting Edge PS kit goes for $63.95. For more info, write to CEE at 1803 Mission St., Suite 546, Santa Cruz CA 95060; tel. (800) 206-0115; E-mail [cee@cruzio.com].

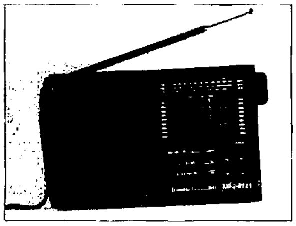


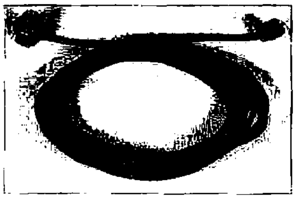
ESP Redesigns PDS-11

Electronic Specialists has redesigned their popular model PDS-11 modem protection system to accommodate the latest 56K modem, Shotgun modem-bonding and modem doubler technology. Enhanced four-stage spike suppression and RFI interference filtering are combined to create reliable high-speed data transmission through the modem, while also protecting connected computer equipment.

Fast response, high-current dual semiconductor suppression networks provide both common mode and differential mode equipment protection. Interstage suppressor buffering also increases overall system operability. Phone leads are fused, further adding protection and reliability to modem and connected equipment. The model PDS-11 module, with 56K modem, Shotgun modem-bonding and modem doubler protection, lists at $74. For ordering information, call (800) 225-4876; FAX (508) 653-0268; or take a look at the Electronic Specialists, Inc., Web page at [http://www.elect-spec.com].







Mini News from MFJ

• The MFJ-731 tunable RF measurement filter allows accurate SWR and impedance measurements between 1.8 and 30 MHz in the presence of strong RF fields. It has virtually no effect on measurements and works with all SWR analyzers. $89.95.

• MFJ's Model 8121 world band receiver lets you travel the world with ease. Covers FM; medium-, long- and shortwaves, with excellent sensitivity and selectivity coming from a built-in telescopic antenna. $39.95.

• MFJ now offers hard-mount coaxial line (17 feet of RG-58A/U) with connectors for installing permanent mobile operation VHF/UHF antenna systems. Both the MFJ-341S (SO-239) and MFJ-341M (NMO) are $19.95 each.

For further information about these or other MFJ products, contact MFJ Enterprises, P.O. Box 494, Mississippi State MS 39762; tel. (800)-647-8324; E-mail [mfj@mfjenterprises.com]; site [www.mfjenterprises.com].

Number 50 on your Feedback card

QRP

Low Power Operation

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Most of us like to build our own gear. If you happen to enjoy designing radios, then you more than likely have laid out your own PC boards. In the past, I've used just about every method I came upon. Without a doubt, the easiest way to lay out a PC board is with a computer. But, if the board is a simple one, you can still use one of these methods.

Several months ago, we talked about using mailing labels and marking pens. They're OK if you only want one board. If you want to make more than one PC board at a time, then you must use the photo etching method. In a nutshell, you make a negative (or positive depending on your chemistry being used) and expose the negative to a photosensitive board. When the photosensitive coating is exposed to UV light, and then developed, it turns in a rather tough resist.

There are a few steps needed to produce a PC board using the photo resist method. The first one is generating the artwork. Years ago, and I do mean years ago, you could make your own artwork using a product called "Bishop graphics." Basically, they were stamped out black crepe paper with a sticky side. You applied the graphic you wanted, say a 14-pin DIP, onto a sheet of Mylar. You then connected the various pads and pins using the tape strips. You assembled your PC board by cutting and placing all the pads, IC pins and other mounts as needed. You could get the Bishop graphics in all sorts of different outlines. They came in 0.300 spacing DIP outlines, TO-92, TO-220 transistor outlines, as well as just about anything you could think of. When you were done with the artwork, you had a graphics house produce a one-to-one negative. This negative was then used to "burn the board."

The actual process varies from chemistry to chemistry, but the basic idea is as follows.

You mounted the photosensitive board in a frame. This frame consisted of a sheet of glass and some clamps. The one I had was homemade and reminded me of a book. One edge was on a hinge. You opened up the frame, put in the board and then the negative. You closed the frame and the sponge backing kept everything tight. You then exposed the board to a source of UV light. I used a UV sunlight lamp. These were also called tanning lamps. Kind of expensive, and somewhat hard to obtain. Depending on the chemistry, it took from one minute to 15 minutes under the UV light. After the exposure time was up, you developed the board. At this time, you can clearly see the photo resist on the copper board. The board is then etched in your favorite chemical. The rest of the process is the same as any other PC board application: drilling holes, stuffing the board and then troubleshooting why it won't work when you're done. This is the biggest drawback using the Bishop graphics. If you have made a goof, you must redo the entire process from step one. And unless you have a darkroom for making your own negatives, it can start getting expensive. Then there is the cost of the Bishop graphics themselves. They're not cheap and they can only be used once.

I did find one really slick way of making a PC board using Bishop graphics and the artwork from a magazine. If you place the Mylar sheet over the top of the artwork in a magazine, you can trace out the layout with the Bishop graphics. It's very time consuming, but if the board is simple, you can make an exact copy of the board from the magazine!

Later on, the popular transfer film allowed you to make a copy of a magazine page with a plain paper copier and then iron the result onto the copper board. Now, you know, I have never been able to get that to work for me! Try as I may, I never got a usable PC board from the ironing board.

I mentioned several times about the chemistry used. You could get either a positive acting or negative acting chemistry. By far the most popular is the negative acting chemistry. If you used the negative chemistry, you needed a negative to produce a board. This required one more step, and usually a trip to the local graphics house to produce the negative.

You could get positive acting chemistry. As the name implies, you only needed to produce a positive image that would be used to produce your PC board. By eliminating one step in the process, you reduced the time needed to make a board. And, you did not have to become friends with the guy at the graphics house. On the other hand, the positive acting chemistry was a bit harder to work with. And to make matters even more hairy, positive acting chemistry cost about fifty percent more than the negative acting chemistry.

That leaves us with the best of PC board layout. That's using a computer. My first attempt at a computer-designed PC board was with a program called

On The Go

continued from page 47

Don't forget that they are dependent upon electrical power to function. Plan on 3 gallons of water per person per day for drinking purposes.

Next is food. Canned food that does not require heating is a relatively easy solution, but don't forget that you'll need to have a can opener that doesn't require electricity. Cold pork and beans may not be the gourmet dish you crave, but it will meet your daily caloric intake. If you have a grill with a side burner you can heat the canned foods, but make sure your tank is full and you have at least one spare. (And don't run your grill inside, of course.)

If you take prescription drugs, lay in a month's supply. If the pharmacy's computer has a problem, refills may not be available. Finally, if you don't live in the sunny South, heat may be an issue. A fireplace is of no real benefit if you lack firewood.

Finally there is communications. The first issue is to be able to receive communications about what is happening in the rest of the world. A simple transistor radio with a supply of batteries or an alternative power source will fill this need nicely. Second is the ability to communicate with others. That will be the basis of the next column.

Am I preparing? Yes. Am I worried? Not really. We're hams, after all, and have dealt with tornadoes, floods, blizzards, hurricanes and every other surprise that nature has thrown at us. I don't think a computer bug can compare with what Mother Nature can throw our way.

Let's use this column as a clearinghouse for information *you* think is important for the Y2K experience. Send your ideas to the E-mail address at the top of the column or by snail-mail to my home.

"Smartwork." It was a very expensive program at the time, about $1200 for the basic package, and worked only on the IBM XT computer. That's how far back it was! This program produced a one-to-one or two-to-one output that you printed on a dot matrix printer. You took this artwork to the graphics house to produce a negative. You processed the PC board in the usual way after you "burned" the board. However, this time if you made a mistake, you could easily fix the screwup on the computer. Of course, you still had to make a new negative and once again burn the board. But the entire process was speeded up. You could move a pad or a line in a matter of seconds instead of hours using the old Bishop graphics.

That was then. This is now. Today, there are many programs that allow you to make a PC board from your computer. You can get software for the Wintel machines as well as the Apple Macintosh computer. And even though all the programs allow you to generate a printed output, now you can produce a color printout thanks to the low cost of the inkjet printers.

And if you don't want to make a negative and burn your own board, you can produce the Gerber files and have someone else make your boards. Having the capacity to make the Gerber files and the NC drill files yourself, you simply upload them to a board house. In a few days, PC boards! Now, you don't get this for nothing, and the process can be expensive, but if you need double-sided PC boards with plated-through holes in two days, it's the only game in town.

Of course, if you wanted to make your own negative, a quick click of the mouse would produce a laser printout of your board. You could then burn your board and process it as usual.

Right now, the only game in town for PC board layout is a computer. There are dozens of programs that perform this function. Next time, we will look at laying out a PC board using a computer. I'll also have some names and addresses for PC board houses that will do limited runs of PC boards, as well as board houses for prototypes. ■

Number 52 on your Feedback card

The Digital Port

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There are some new items of interest to those who read this column. Recently, there was a bit of mail concerning the need for more on RTTY. I won't lay claim to having covered all the software and hardware combinations, but there is something very unique that isn't by any stretch of the imagination pure RTTY.

In fact, at least one opinion says it may be the replacement. The new mode is PSK31. I have observed hams who have been developing it for quite some time, and I admit I didn't fully understand or appreciate just what they were up to.

You may have most of the stuff already

The reports sound very compelling. The hardware needed is already in many ham shacks: a computer with a 16-bit sound card and an HF radio that is stable. It is necessary to build cables from the sound card to the radio. Those of you who have worked with the ChromaPIX SSTV program are already there.

The other essential to get up and running contains that "F" word popular among hams (the one you can say on the air): free! Yes, the software is free for the download from [http://aintel.bi.chu.es/psk31.html].

The truth is, I have downloaded the Windows version of the software, but haven't got into the test mode as yet. I think that if RTTY excites you, you will want to get to this without delay. The zipped program is small enough to put on a floppy at around a megabyte. You will find extensive, well written help files. I printed a little over forty pages of them and it looks like an easy mode to get up and running according to all I read about it. I will have it going in the next few weeks and let you know what I see.

The advantages of the mode sound almost too good to be true. First and most significant is the width of the signal. When you have everything calibrated properly, it is about 31 Hz wide — fabulous! They say it is so narrow, you will easily tune past a signal, weak or otherwise, if you move too quickly. That reminds me: On the Web site, you will find a demo of the sound you are looking for. It is described as a warble, but I felt it was closer to a pure tone with a slight waver. I think that is due to the narrow bandwidth.

New DSP program for your sound card

I have made frequent mention of the excellent SSTV program ChromaPIX, and I hear excellent reports from users. The program, as many of you are aware, is a Windows-based one that utilizes the sound card — thus eliminating the need for additional hardware to send and receive images over the air with DSP filtering.

Recently, Jim N7CXI announced his latest Windows–sound card offering. If you go to the ChromaPIX Web page, you will find, in addition to the SSTV programs, a rundown on ChromaSound. You may download this program (a little over 3 megabytes), execute it, direct the sound from the output of your rig to the sound card on your computer, and start enjoying the marvels of DSP filtering via the output of your sound card.

It is a beta program, looks well finished, and is the product of a lot of work — I think you will enjoy it. It is already configured for regular sideband audio with selectable options for you to point-and-click for individual situations. The screen display includes a spectrum analyzer so you can "see what you are hearing." I like that concept. I find that my listening abilities do not always translate directly to the proper knobs to turn on the audio filter.

Once again I must beg inability to give a complete evaluation, as I have not put the program to the real test. So many toys, so little time.

If it weren't for you observant readers, I would get away with almost anything. Perhaps it pays to get off track once in a while; at least several pieces of E-mail have served to awaken my senses.

A welcome wakeup call came via E-mail from Jason KC8ERI, who commented on a statement I recently made about the Internet spiriting away the potential hams among our younger set. I was pleased to make the acquaintance of what I will term a well balanced 16-year-old mentality.

Jason has been using both ham radio and the Internet to further his education in this high tech world. He didn't simply get a ham license and make the rounds of the FM repeaters. Jason got into packet radio and notes the comparison of speed between packet and the Internet. He offers the opinion that sometime in the future he intends to find a way to not only improve on speed but to add graphic content to packet communication. In other words, he is going to make a contribution to ham radio.

This is the kind of people we must attract to our ranks. I got the impression that he is active in a local club and that the club members have found ways to stimulate his interest. This is one gung-ho young man who will succeed at whatever he desires, I am sure.

Defining "digital"

I received an interesting piece of E-mail from Klaus DL4KCK concerning some of the subjects of this column. He makes a valid comment that one of the modes discussed here is not really digital. He refers to SSTV, and says we may stretch the definition for certain program-hardware combinations such as those using the sound card in the computer.

There is certainly no intention of pulling the wool over anyone's eyes to make them think that all modes discussed are pure "anything." They are simply exciting ham radio modes, and I like to see more hams having fun. If I err on the side of bringing useful information to my readers, so be it. My skin is thick enough to take the flack. No offense intended. Klaus is a well grounded ham, with experience in the field as well as writing abilities. He lists himself as "2nd editor TV-AMATEUR." And there is no argument from this end.

Missing info

Another piece of E-mail from Thad KF2PL awakened me to the fact there was a piece of info missing in the URL chart. Believe it or not, Thad was reading an article from the July '97 issue in which I commented about the XPWare program for the PK-232MBX. He wanted to know where to find it.

It can be exasperating using a search engine to find something you know is out there. I find listings disappearing that were easily located a year ago. So that fine piece of shareware is listed in the chart starting this month. You will find the program available with a substantial trial period upon download.

MFJ software?

Another reader, J.P. KA3BWP, sent a request to locate some software that made me aware of a void in our aftermarket software for TNCs. Correct me if I'm wrong, but I could find only one listing for a program for the MFJ 1278 multimode. Perhaps it is difficult to write for.

I found an old listing from several years back that was, at that time, in the Hamnet library on CompuServe. It no longer existed, and a search on the Internet for that software file proved fruitless. Another search

found a UK Web site for Venus Software at [http://www.venusww.demon.co.uk/vencatam.htm]. There is a program called Skyrider available there. That was all I found, and passed the address on to J.P. If someone knows of other software out there, please let me know.

Antenna update

The mobile antenna article has continued to provoke comments. It has been a great experiment, at this end at least. I have learned a lot. It is successful to a point. For a time, I thought I had a piece of magic growing on the side of the vehicle because it would load on 40, 20, and 15 with no change at the antenna.

It wasn't magic. There is an explanation. The antenna itself resonates on 20 meters and that is it. However, with the 20+ feet of coax connected to it, the antenna appears to resonate, at the transmitter end of the coax on the other two bands. I will, at some point in my life, determine if I can, by varying this length, accomplish a better match and/or cause a match on some other band.

Another revealing part of this project was the use of the LDG Electronics (see chart) antenna tuner. I mentioned previously that I would get one of these kits to see if I could minimize the time of loading the antenna while the vehicle is in motion and keep the eyes where they belong (on the road). The LDG tuner is a marvel. It contains a processor with a sophisticated program that can determine the proper inductance and capacitance combination in just a few seconds when given a load that looks anything like an antenna.

The processor selects among 17 relays, energizes the ones that appear correct, resamples the SWR, tweaks as necessary, and displays via lighted LEDs where the match stands at any given moment. It also allows for manual changes if you wish to reduce the SWR to get closer than the "less than 2:1" the processor accepts. The fun part is listening to the relays quickly rattling away while this selection and sampling process takes place. When the relays shut up, which takes a very short time, the match is made.

Off track

The learning process takes a familiar turn as I receive comments from you folks. I did receive one negative comment; that is understandable because the antenna project seems a little far-fetched for a column that should be focused on digital communication — even if the goal is mobile/portable digital modes.

However, there was a very educational E-mail from Max KO4TV, who gave me a lot of insight into mobile antenna engineering. That was a part of his livelihood through his working years.

Max explained first that the base-loaded antenna I had devised was highly inefficient when compared with a center-loaded one. He also chastised me a bit for not speaking highly of the "screwdriver" continuous tuning mobile antenna, as he has had a lot of good luck with such apparatuses. I will not argue with either point.

The reason for the base-load configuration was cost. The other methods mentioned appeared to be impractical at the outset. Max tells me that he has been more inventive than I and has managed to home-brew screwdriver antennas on a very low-buck budget. I am going to have to spend a little time and get the details from him. That would be a worthwhile project.

I took a look, just for curiosity, on the Internet with a search for "screwdriver antenna," and found a Web site where plans could be ordered for a few dollars from someone else who had apparently done the experimenting.

What does it all mean? We are never done experimenting in ham radio. Just look at this month's column. We have touched on a new version of RTTY (PSK31 — I hope that reference to RTTY doesn't offend), a sound card DSP filter, some antenna ideas that were news at least to me, plus glimpses at innovative hams and their creations.

There is so much to this hobby that is up-to-the-minute and cutting-edge that I wonder what holds people back from wanting to try it all.

If you have questions or comments about this column, E-mail me at [jheller@sierra.net] and/or CompuServe [72130,1352]. I will gladly share what I know or find a resource for you. For now, 73, Jack KB7NO.

Current Web Addresses	
Source for:	**Web address (URL)**
HF serial modem plans + software	http://www.accessone.com/~tmayhan/index.htm
PCFlexnet communications free programs	http://d10td.afthd.th-darmstadt.de/~flexnet/index.html
Tom Sailer's info on PCFlexnet	http://www.ife.ee.ethz.ch/~sailer/pcf/
SV2AGW free Win95 programs	http://www.forthnet.gr/sv2agw/
BayCom — German site	http://www.baycom.de/
Pasokon SSTV programs & hardware	http://www.ultranet.com/~sstv/lite.html
Winpack shareware for Windows	http://www.duckles.demon.co.uk/ham/wp.htm
New Mode — Free DL	http://aintel.bi.ehu.es/psk31.htmi
Baycom 1.5 and Manual.zip in English	http://www.cs.wvu.edu/~acm/gopher/Software/baycom/
Source for BayPac BP-2M	http://www.tigertronics.com/
Tucson Amateur Packet Radio — where packet started — new modes on the way	http://www.tapr.org
TNC to radio wiring help	http://prairie.lakes.com/~medcalf/ztx/wire/
ChromaPIX & W95SSTV	http://www.siliconpixels.com/
Timewave DSP & former AEA prod	http://www.timewave.com
International Visual Communication Association — a non-profit organization dedicated to SSTV	http://www.mindspring.com/~sstv/
XPWare — TNC software with sample DL	http://www.goodnet.com/~gjohnson/
Small computer boards, various kits	http://www.ldgelectronics.com

Table 1. Current Web addresses. If you encounter a problem with a European address, the network is often at fault. Try again later.

CALENDAR

Listings are free of charge as space permits. Please send us your Calendar item two months in advance of the issue you want it to appear in. For example, if you want it to appear in the October issue, we should receive it by July 31. Provide a clear, concise summary of the essential details about your Calendar event.

JUNE 13

BETHPAGE, NY The Long Island Mobile ARC, of Levittown NY, will sponsor the Long Island Hamfair, Sun., June 13th, 8:30 a. m.–2 p.m. at Briarcliffe College, 1055 Stewart Ave., in Bethpage. General admission $6, children and sweethearts free. Free parking for buyers. Vendors: All spaces $15 each, each space admits one person. Parking in assigned spaces. This event will feature amateur radio equipment, computers, CB equipment, TV, and a VHF tune-up clinic where you can get your rig checked. Ham equipment dealers and ARRL info will also be available. Talk-in on W2VL 146.85 rptr. (136.5 PL). For more info call the *LIMARC 24-hour infoline, (516) 520-9311. E-mail [hamfest@limarc.org]*. Richie Selzer N2WJL is the Hamfest Chairman. See the *Web site at [http://www.limarc.org]*.

INDEPENDENCE, KY The Northern Kentucky ARC will hold their "Ham-O-Rama '99" on Sun., June 13th at the Summit View Middle School in Independence KY. From I-75 go east on I-275 to Exit 80 (Covington/Independence–KY 17). South on KY 17 (towards Independence) 5-1/4 miles. For more info or reservations, contact *N8JMV c/o NKARC, P.O. Box 1062, Covington KY 41012; or call (513) 797-7252 in the evening.* Indoor exhibit area for major vendors. Extensive outside flea market with setup at 6 a.m. General admission begins at 8 a.m. Admission $4 in advance, $5 at the gate. Children under 14 admitted free. Flea market spaces $2 each (tables not furnished). Indoor vendor space $15 per table provided. Talk-in on 147.255(+) and 147.375(+) rptrs.

KNOXVILLE, TN The Radio Amateur Club of Knoxville is sponsoring the 33rd annual "Knoxville Hamfest and Electronics Flea Market" on June 13th at the National Guard Armory, 3330 Sutherland Ave., in Knoxville. Open to the public 9 a.m.–4 p.m. Admission $5. 8-ft. tables will be supplied for $15 each. AC power also available. Free dealer passes will be provided for all designated workers. Free beverages available for all inside dealers. Access for dealers and other indoor participants starts Sat., June 12th, 12 noon–8 p.m. ET. Access also available on the day of the hamfest, starting at 6 a.m. ET. Free parking and handicap access. Free outdoor tailgate space with each paid admission. VE exams begin at 2 p.m., registration must be completed before 1:30 p.m. Test fee is $6.45, payable to WCARS/VEC, exact cash or check, please. There will be a clinic showing how to use new technology ham radio equipment. A free product literature and product promotional items area will also be featured. Forums are being planned to discuss ham radio in the next century, public service activities, computer architecture, new FCC regulations, DX, etc. Exhibits will feature new technology equipment, satellite communications and emergency communication equipment. Talk-in on W4BBB 147.30(+), 224.50(-), 444.575(+). For general info and reservations, contact *David Bower K4PZT, P.O. Box 50514, Knoxville TN 37950-0514. Tel. (423) 974-5064 (w) or (423) 670-1503 (h). E-mail [rack@korrnet.org]*. For updated info check the Web page at *[http://www.korrnet.org/rack]*.

SUFFIELD, OH The 32nd Annual Hamfest and Family Picnic will be sponsored 8 a.m.–4 p.m. by the Goodyear ARC at the Goodyear Wingfoot Lake Park, located near Suffield OH, 10 miles east of Akron. Enter from Rte. 43, one mile south of Rte. 224. Admission $4 in advance or $5 at the door. One ticket admits ham, spouse and children. Flea market spaces $10 each or $8 in advance. Vendors (pavilion) $8 in advance or $10 the day of the hamfest. Make checks payable to the Goodyear ARC and mail with an SASE to *David R. White, 719 Notre Dame, Cuyahoga Falls OH 44221*. VE exams available. For more info call *Dave White at (330) 928-7625 or E-mail [rjtaylor@akron.infi.net]*. Talk-in on 146.985 or 146.520. Park rules: no pets, no firearms, no pornographic materials.

WHEATON, IL The Six Meter Club of Chicago, Inc., will hold its 42nd Annual ARRL-sponsored Hamfest at the DuPage County Fairgrounds, 2015 Manchester Road [north of Roosevelt Road (Route. 38), east of County Farm Road], in Wheaton. Free parking. No extra charge for space in the outdoor flea market. Tickets are $5 in advance, for attendees over age 12, $6 at the gate. Advance tickets are available from *Joseph Gutwein WA9RIJ, 7109 Blackburn Ave., Downers Grove IL 60516*, or from any club member. Commercial tables, 8-ft. w/110V $15 each. Indoor flea market tables, 8-ft., no electric, $12 each. Overnight RV parking, includes electrical hookup, $10 each. Send an SASE with check or m.o. payable to *Six Meter Club of Chicago*, and mail to *7109 Blackburn Ave., Downers Grove IL 60516*, no later than May 30th. For information call the 24-hour InfoLine, *(708) 442-4961*. Buildings are open to the public at 8 a.m. VE exams 9 a.m.–11 a.m., call the InfoLine to pre-register for testing. Handicapped parking at the east gate. General parking at the west gate. Sellers, use east gate. Absolutely no alcoholic beverages permitted. All sellers responsible for cleanup of their spaces.

JUNE 18, 19, 20

RED DEER, ALBERTA, CANADA The Central Alberta Radio League (C.A.R.L.) will host its 29th Annual Picnic and Hamfest at the Burbank Campsite located approximately 8 km NE of Red Deer. Talk-in on 147.150 (+600) or 146.520 simplex. For info contact *Bob VE6BLD, 5540 54th Ave., Lacombe, Alberta, Canada T4L 1L6. Tel. (403) 782-3438 evenings. E-mail [kingel@telusplanet.net] or [ve6bld@rac.ca]*. Or E-mail *C.A.R.L. at [carl@qsl.net]*. Visit the home page at *[http://qsl.net/carl/]*. *Bill VE6WMG, at (403) 749-2063*, is also available to relay more info about this event.

JUNE 19

DUNELLEN, NJ The Raritan Valley Radio Club, Inc., will present a hamfest on June 19th, 7 a.m.–2 p.m., at Columbia Park in Dunellen, near the intersections of Route 529 and 28. Sellers can set up at 6 a.m. Admission $5. Spaces $5 each. Official DXCC and WAS verification. Talk-in on 146.025/.625 and 146.520 simplex. Contact *Bob Pearson WB2CVL, (732) 846-2056; or Fred Werner KB2HZO, (732) 968-7789 before 8 p.m.*

MARMORA, ONTARIO, CANADA The 1999 Eastern Ontario Hamfest and Computer Flea Market will be held Sat., June 19th, 9 a.m.–2 p.m. at the Marmora Area Curling Club, Crawford Drive, Marmora. Marmora is located about 40 miles east of Peterborough on Highway 7 (the Trans Canada Highway) and about 30 miles north of Belleville, Ontario, on Hasting County Road 14 (formerly Highway 14). Talk-in will be on 146.520 MHz. Contact *Paul VE3UUM at (613) 472-3449; Pete VA3PGB at (613) 473-1171;* or E-mail *[rhobson@blvl.igs.net]*. See the Web page at *[www.redden.on.ca/~tcarc/tricnty.htm]*.

MIDLAND, MI The 23rd Annual Hamfest, sponsored by the Midland ARC, will be held at the Gerstacker Fair Center at the Midland County Fairgrounds in Midland. The show features amateur electronics and equipment, both new and used, VE exams, and door prizes. Doors open to the public 8 a.m.–1 p.m. Setup is at 6:30 a.m. Admission is $4, advance reserved tables $6 each plus admission; walk-in tables, if available, $10 plus admission. Trunk sales $5 per spot plus admission. Talk-in repeater W8KEA, 147.00(+). For more information, write with an SASE to *M.A.R.C. Hamfest, P.O. Box 1049, Midland MI 48641-1049*. Or call *Del Lafevor at (517) 636-5097*

(w), (517) 689-3477 (h); or E-mail [lafevordel@aol.com].

JUNE 20

CAMBRIDGE, MA The MIT Electronics Research Society, the MIT Radio Society, and the Harvard Wireless Club will hold a tailgate electronics, computer, and amateur radio flea market 9 a.m.–2 p.m. at Albany and Main Sts. in Cambridge. Admission $4. Free off-street parking. Fully handicapped accessible. Sellers $10 per space at the gate, $9 in advance, includes 1 admission. Setup at 7 a.m. Covered tailgate area available for all sellers. For space reservations or further info call (617) 253-3776. Mail advance reservations before June 5th to *W1GSL, P.O. Box 397082 MIT BR, Cambridge MA 02139-7082.* Talk-in on 146.52 and 449.725/444.725 PL 2A W1XM rptr.

MONROE, MI The Monroe County Radio Communications Assn. will hold its annual "Monroe Hamfest" 7:30 a.m.–1 p.m. at the Monroe County Fairgrounds, 2 miles west of Monroe on M-50. Setup starts at 6 a.m. Indoor tables $15 for first 8-ft. table and 1 ticket; $10 for each additional table. Trunk sales $6 per 8-ft. space. Overnight camping $15. Free parking. Talk-in on 146.72. Admission $6 in advance (includes two stubs for the drawing), $6 at the door, with one stub. Contact *Fred VanDaele KA8EBI, 4 Carl Drive, Monroe MI 48162. Tel. (734) 242-9487 after 5 p.m.*

JULY 4

BRESSLER, PA The W3UU 27th Annual Fire Cracker Harrisburg RAC Hamfest and Computer Show will be held Sun., July 4th, at Emerick Cibort Park in Bressler (near Steelton/Harrisburg PA). Setup at 6 a.m. General admission at 8 a.m. No food or beverage sales permitted by vendors or tailgaters. All vendors must have a PA Sales Tax Permit and must collect the sales tax. Donation $5. XYL, YL and kids free. Persons entering the park before 8 a.m. will be charged a minimum of (1) tailgating space or minimum of (1) table! Tailgating $5 per space. Make your table reservations early. Tables under roof with electricity $15 each for the first three tables; additional tables $12 each if paid before June 15th. After June 15th all tables are $18 each. Talk-in on 146.16/.76 MHz and 146.52 MHz simplex. For hamfest info call *(717) 939-4825.* For table reservations, contact *Richard Bordner W3NJB, 2501 South 2nd St., Steelton PA 17113. E-mail [n3njb@aol.com].* Send an SASE for a map, lodging, and restaurant info. VE exams at the Friendship Fire Hall at 9 a.m. Follow the hamfest signs, on Hwy. 441, to the square. At the square take the "y" to the left onto Main St., as if going to the hamfest. Go 0.7 mile to the Friendship Fire Hall on the right at the corner of Main and Center. Just walk in. Space is limited. Items required: your original FCC license (if licensed) and a copy of the license; any original CSCEs and a copy; two (2) forms of ID (at least one photo ID) showing your full name and address; and a check or money order in the amount of $6.45 made out to ARRL/VEC.

JULY 10

PETOSKEY, MI The Straits Area ARC's 23rd Annual Swap & Shop will be held Sat., July 10th, at Emmet Co. Fairgrounds in Petoskey on U.S. 31, 2 blocks west of 131, 8 a.m.–1 p.m. Talk-in on 146.68(-). Admittance $3 at the door. Tables $5, splits OK. VE exams at the American Red Cross Bldg. at 1 p.m. For testing info., contact *Tom W8IZS, (616) 539-8459; or Dirk KG8JK (616) 348-5043, [kg8jk@qsl.net].* For testing info, contact *Floyd KG8CS, (616) 526-5503.*

JULY 11

PITTSBURGH, PA The North Hills ARC will hold its 14th annual Hamfest July 11th, 8 a.m.–3 p.m. at the Northland Public Library, 300 Cumberland Rd., approximately 10 miles north of Pittsburgh on Route 19 North. From Pittsburgh take Exit 18 on Rte. 279 to McKnight Rd., north to left on Cumberland Rd. From I-79 Exit 22 take Rte. 910 east to Rte. 19, south to Cumberland Rd. From PA Turnpike Exit 3 take Rte. 19 south through Wexford on Rte. 19, turn left onto Cumberland Rd. at the Sunoco. Talk-in and check-ins will be on 149.09 W2EXW, the North Hills ARC rptr. Free admission. Free parking. One free automobile-sized space per tailgater; each additional space $5. The hamfest is handicapped/wheelchair accessible. Contact *Rey Whanger W3BIS, 120 Cove Run Road, Cheswick PA USA. Tel. (412) 828-9383. E-mail [w3bis@freewwweb], or check the Web site at [http://nharc.pgh.pa.us].*

VALLEY FORGE, PA The Mid-Atlantic ARC will host a Hamfest at Kimberton Fire Company Fair Grounds, Rte. 113, south of the intersection with Rte. 23, on July 11th, starting at 7 a.m. Indoor-outdoor space available. Indoor tables with electr. 1–4 $10 each; 5 or more $8 each, not including admission. Tailgating $5, no reserved tailgate space. Admission $5. Talk-in on 146.835(-) and 443.80(+) CTCSS 131.8. Computer and electronic hobbyists are welcome. Contact MARC, P.O. Box 352, Villanova PA 19085; or call *Bill Owen W3KRB at (610) 325-3995. E-mail [wb3joe@marc-radio.org]. The Web site is at [http://www.marc-radio.org/hamfest.html].*

JULY 18

CAMBRIDGE, MA A tailgate Electronics, Computer, and Amateur Radio Flea Market will be held Sun., July 18th, 9 a.m.–2 p.m. at Albany and Main Sts. in Cambridge. Admission $4. Free off-street parking. Fully handicapped accessible. Sellers $10 per space at the gate, $9 in advance—includes 1 admission. Setup is at 7 a.m. For space reservations or further info call (617) 253-3776. Mail advance reservations before July 5th to *W1GSL, P.O. Box 397082 MIT BR., Cambridge MA 02139-7082.* This event will be held rain or shine. Covered tailgate area available for all sellers. Talk-in on 146.52 and 449.725/444.725 PL 2A, W1XM rptr. Sponsored by the MIT Radio Society and the Harvard Wireless Club.

SUGAR GROVE, IL The Fox River Radio League will hold their Annual Hamfest at Waubonsee Community College, Rte. 47 at Harter Rd., Sugar Grove IL (5 miles NW of Aurora). Doors open Sun. at 8 a.m. with setup Sat. at 7 p.m., and Sun., 6 a.m.–8 a.m. VE exams at 10 a.m. Bring original license, copy of license, and photo ID. Talk-in on 147.210(+) PL 103.5/107.2. Contact *James Von Olnhausen N9UZC, c/o FRRL, P.O. Box 673, Batavia IL 60510. Tel. (630) 879-3042; or E-mail to [n9uzc@amsat.org].* The Web site is at *[http://www.frrl.org/hamfest.html].* The Fox River Radio League is celebrating 75 continuous years as an amateur radio club. There will be special anniversary promotions at the hamfest.

VAN WERT, OH The Van Wert, Ohio, ARC's 12th Annual Van Wert Hamfest will be held at Van Wert County Fairgrounds, US Rte. 127 South, 8 a.m.–3 p.m. Radios, computers, software, electronic parts, new and used. Indoor tables and outdoor trunk sales. Free parking. Overnight $10. Tickets $5. Talk-in on 146.85(-). For table reservations, send an SASE with your name and address to *Van Wert ARC, P.O. Box 602, Van Wert OH 45891-0602; Tel. (419) 238-1877; or E-mail Bob WD8LPY at [bamesrl@bright.net]; Web site is [http://www.bright.net/bamesrl/w8fy.html].* 8-ft. tables $10 each (includes one free ticket). Trunk sales: 12-ft. x 1-ft. area, $5 plus ticket. VE exams: Must pre-register by July 11th. Contact *Bob High KA8IAF, 12838 Tomlinson Rd., Rockford OH 45882. Tel. (419) 795-5763.*

SPECIAL EVENTS, ETC.

WORKED ALL PARISHES

BATON ROUGE, LA The Baton Rouge ARC continues to offer the Worked All Parishes award for hams who can show confirmation of contacts with all 64 Louisiana parishes on or after September 1, 1996. For further information, send SASE to *L. Wayne Gordon K5EOA, Baton Rouge Amateur Radio Club, P.O Box 4004, Baton Rouge LA 70821.*

JUNE 12

RONDOUT, IL The Lake County IL RACES will operate W9R, 1400Z–2300Z June 12th, commemorating the 75th anniversary of the Great Rondout Train Robbery. Operation will be on 146.490 simplex; 7.283, 14.283 and 28.383 phone; 7.037, 14.037 and 28.037 CW. A commemorative certificate suitable for framing is available from *Lake County RACES, 1303 N. Mil-*

DEAR READERS,

I need your help! I really appreciate your sending in your feedback cards. Now, I'd like to know something about your hamshack habits.

Return this survey and take part in *73*'s random drawing of all the survey responses received by **July 31, 1999**.

The winner will receive $100 cash and a Life Subscription to *73* (okay, so you're already a "lifer" — give your "prize" to your grandchild).

I'm also giving away 50 surprises to the first 50 people who respond. We'll announce the big winner's name in our September '99 issue. So, please answer the questions and return them to me at:

Wayne Green W2NSD/1
73 Amateur Radio Today
70 Hancock Road
Peterborough NH 03458

FAX to (603) 924-8613
E-mail: design73@aol.com

Thanks,

Wayne

Your name & call ______

Street ______

City/State/ZIP ______

Tel. ______

1.) How did you get this copy of *73*?
__subscription __dealer __borrow
__other

2.) How many other people read this copy?
__none __one __two __three or more

3.) What other ham magazines do you subscribe to?
__*QST* __*CQ* __*CQ/VHF* __*Worldradio*
__other ______

4.) What is your license class?
__Novice __Tech __Tech Plus
__General __Advanced __Extra

5.) How old are you?
__under 20 __21-30 __31-40 __41-50
__51-60 __61-70 __exalted

6.) What are your favorite hamming activities/modes (check all that apply)?
__CW __SSB __QRP __RTTY
__SSTV __FSTV __RDFing __packet
__microwaves __moonbounce __hamsats
__repeaters __contesting __club activities
__DXing __certificate hunting __kit building
__tube equipment __original design & construction
__mods __other ______

7.) Do you use a computer in conjunction with hamming?
__yes __no (if no, go to question 10)

8.) If so, do you use it for:
__operating __getting info __chat and BBS
__other ______

9.) If so, is it a:
__PC __Mac __desktop __laptop

10.) Approximately how much did you spend on ham gear in **1997**?
__nothing __$1-100 __$101-500
__$501-1000 __$1001-2000 __$2001+

11.) Approximately how much did you spend on ham gear in **1998**?
__nothing __$1-100 __$101-500
__$501-1000 __$1001-2000 __$2000+

12.) Approximately how much have you spent in the first six months of **1999**?
__nothing __$1-100 __$101-500
__$501-1000 __$1001-2000 __$2000+

13.) Approximately how much will you spend in the second six months of **1999**?
__nothing __$1-100 __$101-500
__$501-1000 __$1001-2000 __$2000+

14.) Approximately how much will you spend on ham gear in **2000**?
__nothing __$1-100 __$101-500
__$501-1000 __$1001-2000 __$2000+

15.) I would like to see more ads in *73* on the following:
__xcvrs __antennas __towers __rotors
__HTs __power supplies/amps __mobile ops
__antenna tuners __keyers/keys __mics
__meters/test equip. __scopes __discrete parts
__lightning/surge protectors __ham software
__computer hardware __surplus equip. __kits
__code courses __wire/cable __repeater ops
__books __ham magazines __batteries
__computer magazines __QRP __ATV/SSTV
__tubes/tube equip. __filters __local dealer products and specials __station accessories
__RTTY __packet __other ______

16.) Refer to our ad index on page 49. Please name your Top Ten advertisers NOT LISTED THERE that you would like to see in *73*:
1. ______ 6. ______
2. ______ 7. ______
3. ______ 8. ______
4. ______ 9. ______
5. ______ 10. ______

17.) I might buy something from these 3 companies if I saw more ads from them or knew more about their products:
1. ______
2. ______
3. ______

18.) The thing I like least about *73* is: (Write clearly)

19.) The thing I like most about *73* is:

______

waukee Ave., Libertyville IL 60048. Check the Web site at [www.races.org] for last minute updates.

JUNE 12, 13

PORTUGAL DAY DX CONTEST The Rede dos Emissores Portugueses will sponsor the Portugal Day DX Contest on phone (SSB) only, on 10 15, 20, 40 and 80 meters, using the recommended IARU band plan for Region 1. For more information, contact *REP—Rede dos Emissores Portugueses, Award/Contest Manager, P.O. Box 2483, 1112 Lisboa Codex, Portugal.*

JUNE 15–30

GREENVILLE, TX The Sabine Valley ARA will operate W5A from June 15th–June 30th, during Field Day. QSL to *SVARA, P.O. Box 8122, Greenville TX 75401.*

JUNE 19, 20

CHACO CANYON, NM Special Event Station N5C will operate Sat. and Sun. 1600 UTC–2400 UTC from Chaco Culture National Historical Park NM (grid square DM66ba) in CW, SSB, AMTOR and FM, on 2–40 meters QRO and QRP, in the Novice/Tech/General portions of the bands. Chaco Canyon is one of the oldest and most mysterious sites in the southwestern USA. Several ancient astronomers had recorded their observations for all to see over 1,000 years ago on the walls in Chaco. QSL and SASE with a #10 envelope to *N5C, Jay Miller WA5WHN, P.O. Box 6552, Albuquerque NM 87197-6552, USA.* E-mail *[wa5whn@hotmail.com]* for more info about this Special Event Station; or view the following URL: *[http://www.swcp. com/~n5zgt/].* Click on the N5C icon.

JULY 18

STRATFORD, NY The Fulton County Dr. Mahlon Loomis Committee will operate W2ZZJ on July 18th to commemorate the 173rd anniversary of the birth of Dr. Loomis, the American radio pioneer, who was born at Oppenheim NY on July 21st, 1826. Operation will be from 1300–2000 UTC on the General class phone portion of 75, 40, and 20 meters, and on the Novice 10 meter phone band. Also on area 2-meter FM repeaters. For a parchment certificate and extensive literature, send QSL, contact number, and a #10 SASE (55 cents) to *George P. Sadlon W2ZZJ, 5738 St. Hwy. 29A, Stratford NY 13470 USA.*

NEVER SAY DIE
continued from page 4

benefits and excitement they provide.

This is pretty much the way the Sudbury Valley School in Framingham (MA) operates, and their graduates are outstanding. Did you bother to read the $9 book about the school I reviewed in an earlier editorial, which is also reviewed in my *Guide to Wisdom?* I was afraid not. I can lead you to the Fountain of Youth, but I just can't get you to drink. Not even a sip.

There's a lot more to my school proposals, but I've written about them before. The potential is there for us to reinvent our public schools and make them the very best in the world.

Unions

It's been quite some time since I made a serious effort to anger union members. My apologies.

Thomas Sowell got me going with this: "The biggest single obstacle to the improvement of American education is the National Education Association, by far the country's biggest union."

Unions served an important purpose when they were started, giving workers some bargaining power with employers. Unfortunately, power corrupted the unions, just as it had employers. I won't go into a twelve volume history of union corruption. But I have seen it first hand in my own work when I was working for GE, for WPIX in New York as a cameraman, and with the first printer I used for *73*. Both the stage hands' and the printers' unions were so closed that only the sons of union members could join, thus keeping wages artificially high.

Unions have had a powerful role in forcing manufacturers to move blue-collar work out of the country. And they are the major power behind the escalation of the minimum wage (thanks, Ted Kennedy!) — which keeps kids from getting low-wage entry jobs into the workforce.

The NEA keeps endlessly repeating that the only problem with the American public school system is the lack of money. It would be difficult for the NEA to tell a bigger lie. There are endless studies which show that more money has virtually no effect on the quality of American education. We're already spending twice as much as other countries whose students outscore ours on international tests.

Unfortunately, the NEA's lobbying ($) in both state and national elections has the Clinton Administration and Democrats solidly backing the throwing of still more money into the school system. The cost per pupil has been zooming upward as fast as the kids' test scores have been plummeting.

The failure of our school system isn't due to lousy parents, TV, or "society," it's due to the NEA, the bribed Democrats, and the failure of the Republicans to touch the subject with a ten-foot pole. Phooey on both your houses. At a time like this I sure wish Perot hadn't made such an awful mess of his Reform Party.

Colleges

India has a college system that's helping to fill the engineering vacuum created by our rapidly declining American colleges. Maybe you've read about the Indian Institute of Technology. If so, you know that over 30% of their graduating classes head immediately for the US, with most moving to Silicon Valley.

Our public schools are the major problem, with their not teaching the math and science fundamentals that engineers and technicians need. But our colleges are pathetically out of touch with the current world, held there by the power of their entrenched faculties, who have been fighting to prevent change. I've had first-hand knowledge of that.

Please read *The Fall of the Ivory Tower* by Hillsdale College president Roche. It's a scary exposé of our universities today. Yes, I've reviewed it in my editorials and it's in my wisdom guide.

Die De Die

The ham industry manufacturers (and dealers) are hurting. Badly. Unfortunately, as happened 35 years ago, some, perhaps many, are going to go out of business. No, it doesn't have to happen — if they keep in step with the times and don't try to do business today the way they did it in the past.

The world of amateur radio in 1999 is different, even from the way it was in 1997, just a couple years ago. Different? You bet. Maybe you haven't paid attention to what's been happening with the new licenses and how they've dropped dramatically in the last couple of years. I've been chronicling this in my editorials, but I suspect that few manufacturers have been bothering to read 'em.

The worst newcomer drop has been in the General-and-up classes, the people who are the best candidates for buying HF equipment, towers, rotators, and beams. As of last November, 94.5% of all new licensees were Techs! Worse, the number of these new Tech licensees is down 47% in the last two years. Plot this on some graph paper (or on your computer) and you'll see that if this continues as it has for the last two years, we'll have zero new licenses being applied for within two years.

So where can the industry turn for the changes needed to turn this catastrophe around? Well, our *only* national organization is the League, and it seems to be managed by a bunch of old men with no vision of the present, much less the future. These are the fuddy-duddies you can't keep yourself from re-electing as directors.

If I were a manufacturer today I'd make damned sure that I had some products of interest to Techs, since they are the newcomers to the hobby — and the biggest part of the market is the newcomers who are buying their first stations and antennas. Since the number of Techs upgrading to HF tickets has dropped off almost 50% in the last couple of years, and is projected to reach zero by 2006, the HF market is not going to do much unless we see some major rule changes. Major.

With the Techs rightfully assessing the League as their enemy, advertising in *QST* is mainly going to reach the old-timers, most of whom already have all the equipment they're going to need until we see some new technologies developing that aren't even on the radar screen so far.

Techs are not into contests, so they're not reading *CQ* either.

Gee, I wonder what magazine they're reading?

The ham manufacturers could get the League directors to start thinking if they wanted. If a few started moving their ads from *QST*, the word would quickly get through to them that it's time to stop reacting and start thinking. As our national organization, it is the League's responsibility to make sure that the hobby stays healthy and growing — two things it isn't.

Your membership in the League and your patronizing of their advertisers will guarantee that nothing changes. Your membership is your vote, backed with your money, for the League not to change. Your patronizing of *QST* advertisers is your vote for no change.

I watched the entire ham industry of the 1950s and early '60s commit suicide, supporting the League that was killing them. Hallicrafters, National Radio, Gonset, Barker & Williamson, Millen, Hammarlund, Multi-Elmac, Central Electronics, Sideband Engineers, Galaxy, World Radio, and so on all went bankrupt at the hands of the League. Every single major ham equipment company and about 90% of the ham dealers folded within a couple of years, loyally advertising in *QST* until they went out of business.

I don't think anything is going to change. Old-timers will not be able to stop themselves from renewing their League membership. Amateurs will not be able to stop themselves from patronizing the manufacturers and dealers who are the life blood of the League.

Meanwhile, the youngsters who we used to be able to recruit have (a) very likely never heard of amateur radio and (b), if they have, don't see why they should face the code barrier when they can already talk anywhere in the world on the Internet for a lot less money and effort. And without interference or the neighbors complaining about TVI or their ugly tower.

Tell me: When was the last time you saw amateur radio mentioned in any of the national media. Seen anything on TV? Amateur radio is following CB into oblivion in the mass consciousness. Hello, Newington, is anyone home?

Y2K Law Passed

The Year 2000 Information and Readiness Disclosure Act, a new law, provides protection from liability for statements in Year 2000 readiness claims. And that's even if the statements turn out to be inaccurate! That's undoubtedly a big disappointment to lawyers, some of whom have been predicting that Y2K suits will tie up the courts for years and result in billions of dollars in damages being paid.

Gee, too bad.

But, on the other hand, the law seems like a license for businesses to stop spending so much money trying to solve their Y2K problems. Oh well, a few months from now we'll know whether Y2K was the predicted speed bump in the road or a catastrophe which put the whole world out of business. I can hardly wait. In the meantime, I think I'll make sure I have some dependable emergency power for my rig. Just in case. Hey, you never know.

Y2K Bad News

The big midwestern utility, Alliant Energy, is advising some customers to buy their own power generators if they want to be sure they have power in 2000. Alliant is also asking regulators for a $16.1 million rate hike to cover the costs of Y2K computer repairs. Though they've been working diligently on the problem, with 176,000 pieces of equipment and 6,000 vendors and suppliers, it's now clear that everything won't be fixed in time, so they're warning their customers.

I suspect that the only difference between Alliant and the rest of the power industry is that Alliant is being honest. We've seen many examples of how some small problem in the power grid can shut down large areas of the grid. The domino effect. So, with thousands to millions of embedded chips that need to be found and replaced, how ready are you going to be in the dead of next winter if your power shuts off for a few hours, days, or weeks?

Last winter, when the worst ice storm in history hit the Northeast, we lost power for almost a week, and we were far more fortunate than thousands of other families. We moved to a motel 25 miles away, where they still had power. We could have bundled up and survived, but it would have made the event a lot less memorable.

How well prepared are you to celebrate New Year's Eve this year?

Y2K Again?

Well, where else are you going to keep up with the hand wringing over the inevitable "bump in the road" or "terrible catastrophe"?

Perhaps FDR hit it on the head when he said, "We have nothing to fear except fear itself." But fear can be a powerful motivator. I know that if I were living in a city I'd be starting to get edgy about being near there come New Year's Day.

There's an increasing awareness that, though many banks are Y2K compliant, all it could take to topple the dominoes would be a few non-compliant banks anywhere in the world network. Or is it a house of cards? Anyway, the Fed is banking (pardon) on there being some extra cash demands from panicky bank customers, so they're printing an extra $50 billion. Hmm, let's see, with 350 million people that's only $150 each. That's not going to keep the ATM machines in business for long.

It could start to get tight later this year as businesses that deal in cash start putting some of it aside instead of banking it, "just in case." Some more prudent businessmen will be drawing cash from their businesses and putting it aside.

Hmm, what would happen to our cash supply if people in other countries start worrying about their banks and the value of their currency and start hoarding dollars? Hey, just in case, you know.

If cash gets in short supply its value will go up, with some predictions of a five or ten times increase. The potential for this bonanza will help encourage more people to hoard cash. Just in case, of course.

Yes, I know, the banks have almost all of your money out in loans and mortgages, so their cash cushion is very thin. If more than 3% of their customers want their money, the bank has to close its doors. Another house of cards.

Say, have you got some emergency power up and running for your ham station, or are you dependent on the power grid and gas stations?

When Art Bell asked power company employees to call in to his show, a bunch of them said that their supervisors at their power company were busy buying home generators and solar power systems. Hmmm.

Business Week had a short note reporting that the Gartner Group tech think tank says 83% of the current off-the-shelf software may have Y2K problems, down from 89% a year ago. Well, now, *that's* progress!

Exporting Jobs

Maybe you've noticed that all of the big companies are going international. Many are even moving their headquarters to other countries. So what does that mean to Joe Blow from Windy City? Nothing, if Joe is self-employed, but if he's a blue or white collar worker with a big company, it means that he's in competition for his job with an awful lot of better educated, higher-skilled workers in countries with far lower wages, fewer benefits, and less restrictive labor laws.

With communications and shipping costs continuing to drop, smaller and smaller companies are outsourcing their work in lower wage countries.

A few years ago, when my software company got fairly large, I got into serious talks with the Irish government. They wanted me to move my software development division to Ireland and they offered to do almost anything it took to get the jobs for Ireland. They'd train the workers, help pay for the new building, and give me a ten year tax break.

When I was a kid it was a big deal to get any clothes that were not made in the USA. Imported! Wow! Now my shoes were made in China, my shirt in Malaysia, and my pants in United Arab Emirates. I looked at another shirt and it was made in South Africa; my new pants are from Pakistan. My jogging suits are from Bangladesh and the Dominican Republic, and my Nike running shoes from China. My business suit is from Hong Kong and my blazer from Korea, like my snow boots. My watch is from Japan, of course.

It wasn't that many years ago that New Hampshire was a major shoe manufacturer. Now all we have are a bunch of huge old crumbling factory buildings.

Alas, our school system, which was set up on a factory production system to turn out workers for our factories, is still doing just that — it's just

that the factories are now in other countries and our graduates have nowhere to go for good-paying jobs. The workers are piling up in the warehouse as they come off the public school and college conveyor belts.

Earthquake?

No, I suspect that rumbling sound we've been hearing is the turning of the framers of the Constitution in their graves. Ben Franklin, Washington and the rest of them never imagined what the government they founded a couple hundred years ago would evolve into, despite their best efforts in writing the Constitution to prevent just what's happened.

Maybe you saw the *60 Minutes* segment on how much politicians are depending on focus groups these days. These groups not only tell politicians what to think, but how best to manipulate the people to go along with their skullduggery. They pointed out how Clinton's handlers consult focus groups before his every speech, and we the people, hearing the spin aimed at what they've found we want to hear, believe what we're hearing.

Then there are the thousands of paid lobbyists in Washington, distributing tens of millions of dollars to the Congress we elected. And keep right on electing, no matter how crooked they are. The companies and unions footing the lobbyist bills are obviously getting what they've paid for, otherwise the money spigot would get turned off.

I was amazed at the list of registered lobbyists here in New Hampshire. They're in every state capitol, their bags of money at the ready to influence legislators.

Did you see the *60 Minutes* segment about how the Forest Service got the local police to raid the home of a guy who had property they wanted? They claimed they had spotted some marijuana plants growing on his property from the air. So the police moved in, shot the property owner, and confiscated his property. No, no marijuana was found.

Hmm, interesting. Say, how are the Red Sox doing?

Economics I

You haven't been paying much attention to the trade deficit, have you? Tsk.

Let me explain what's going on in simple terms. If your family expenses are greater than your income, you're going to have to either sell off assets to pay your bills, borrow money, or go into debt. The problem with debt is that your creditors will only put up with so much of it. They want their money!

Your income and net worth limit how much you can borrow.

Nothing new there, but what you may not have considered is that the same rules apply to any business, and that includes the business of running towns, states, and even countries.

A business has to sell products or services to bring in money. So does a state, and that means selling products outside of the state, not just moving money around within the state. Ditto the country.

If the US buys more imported products than it sells to other countries, it's going to go into debt. We can, to some degree, borrow money to cover our extravagance, but creditors do not have unlimited patience or credulity.

With more and more of our manufacturing moving to lower wage, higher educated work forces in other countries, we have less and less to sell, so our trade deficit has been soaring.

Lower wages? If you were a manufacturer paying $8 to $10 or more an hour for work, would you get interested in moving your plant to Mexico, where the average wage is $1.60 an hour, and the shipping only takes hours to the US, with no import taxes? Or perhaps you'd start looking at China, where the average wage is 40¢ an hour and it takes about three weeks to ship in the products.

We long ago lost our consumer electronics industry to Japan. This was no accident. The Japanese Ministry of Industry and Trade (MITI), applying Demming's teaching about quality, took this high-profit industry away from us. And look what they've done to the car market we used to own! And tools, cameras, and so on for many high-profit industries.

Our low-profit industries have moved into dozens of low-wage countries. Most of our clothes and shoes are being made overseas, and that's a huge industry.

More and more, what we have to sell is intellectual property — movies, CDs, books, and software. But how long will we be able to make money selling these products if they are available for free via the Internet? And that's where things are headed with the Web.

Web-distributed books can include just about anything imaginable in graphics, including video. My Data-Diskman lets me read books which are stored on disks the size of a 3.5" not very floppy. How long before I'll be able to dump more books to disks via the Web?

So, how, with the way things seem to be going, can the US work its way out of trade deficits? Well, one way we're ahead of the rest of the world is in commercial farming. I'd like to see our school system improved so we could again be world leaders in intellectual work — high-tech, inventing, and artistic creativity. But if we could improve the value of our crops, I'll bet we could again have a trade surplus.

I'm suggesting bigger, better tasting, faster growing, healthier-to-eat farm produce. We have the technologies to do this, but like many other new technologies, we're not bringing them on line. Oh, I guess we did pretty well with personal computers. I started the first personal computer magazine in 1975, just 24 years ago, and despite the resistance of the then entrenched computer industry, our microcomputers are now ruling the world. And, mark you, it isn't the microcomputers that are going to crash at Y2K, it's the embedded chips and old mainframe computers.

We know how to grow much, much better crops — using Sonic Bloom, ground rock "fertilizer," magnets, and so on — we just haven't been getting the word out to counter the chemical conglomerates selling NPK fertilizer and the pesticides their use makes necessary.

Well, I admit I've written about most of this before, so stop complaining and get busy helping to change the system which is bleeding us with trade deficits.

Microbroadcasting

A judge has ordered Free Radio Berkeley off the air! I can understand the FCC's need to stem the chaos that thousands of microbroadcasters might cause, but they'd do better to recognize the need for such a service and set about organizing it instead of fighting it.

These small broadcasters rarely are causing interference to the commercial FM stations, and they provide an outlet for special interest information and entertainment that doesn't have a large enough constituency to support a commercial FM station — which costs hundreds of thousands to millions of dollars to establish.

As broadcasting via the Internet gets more popular, this will provide an international audience for more microbroadcasters, but it'll be a while before we'll be able to tune in Web broadcasters on our car radios and Walkmen.

There are an estimated thousand microbroadcasters at present, so the FCC has an expensive road ahead if they are going to try to shut them all down. Will Congress endorse the budgeting of several million dollars to track down and put these little entrepreneurs out of business?

Ear Plugs

Continued on page 61

Number 60 on your Feedback card

PROPAGATION

Jim Gray W1XU/7
210 E Chateau
Payson AZ 85541
[jimpeg@netzone.com]

June 1999						
SUN	MON	TUE	WED	THU	FRI	SAT
		1 F	2 F	3 F-G	4 G-F	5 F
6 F	7 F	8 F-G	9 G-F	10 F-G	11 G-F	12 F-P
13 P-VP	14 P	15 P-F	16 P-F	17 P-F	18 F	19 F-G
20 G	21 G-F	22 F-P	23 P-F	24 F-G	25 G-F	26 F
27 F	28 F	29 F-P	30 P			

June

A quick look at the calendar shows very few Good (G) days for HF propagation (DX) this month. "Conditions" on most days are trending between Good to Fair (G–F) or Fair to Good (F–G). The really Poor (P) and Very Poor (VP) days anticipate disturbances in Earth's magnetic field and ionosphere due to solar flares or other solar phenomena; they are expected from the 11th to the 14th and again on the 29th and 30th.

DX propagation conditions during the day following recovery from a geomagnetic storm (unsettled to active ionosphere) are often very, very good — specifically on June 15th and 16th, and July 1st and 2nd.

Midsummer days usually show poor DX conditions compared with spring and fall, because ultraviolet radiation from the Sun during the peak hours of daylight (northern hemisphere tilted toward the Sun) causes the ionosphere to absorb instead of reflect (refract) HF band signals. However, VHF signals can benefit at such times, and when HF bands are particularly poor, 6 and 2 meters could provide some excellent DX opportunities. (See band-by-band forecast.)

July

July is never a particularly good month for DX on the HF bands due to high signal absorption levels, and particularly *this* July because we are in the early stages of sunspot cycle 23, in which the solar flux values remain disappointingly low. VHF can be quite good, along with meteor scatter opportunities (Delta Aquarids) for about ten days beginning July 29th.

Your *best* time to work HF band DX will be the 3rd-6th, 19th-21st, and the 25th. The *poorest* days are likely to be the 13th-17th and the 31st. Remaining days will be Fair or trending between one condition and another (see calendar).

There will be a partial lunar eclipse on July 28th, visible in parts of Antarctica, southern and western parts of South America, Central America, parts of North America (except north of Alaska), the Pacific Ocean, Australasia, and eastern parts of Asia.

By the way, if you're interested in weather and other geophysical phenomena, keep a sharp lookout for "conditions" surrounding the 13th and 26th and *semper paratus*.

Please note that the band-by-band forecast and the band-time chart are the same for both June and July.

Band-by-band forecast

10–12 meters

Possible short-skip opening due to sporadic-E ionization out to 1300 miles should occur on most days, and to occasionally longer distances on a few days.

15–17 meters

Regular north-south path openings and occasional openings toward Europe and Africa peaking during local afternoon hours can be expected.

20 meters

This is likely to be the best band for worldwide propagation of signals that will be strongest an hour or two after local sunrise and again in the late afternoon and early evening hours. Short-skip beyond 500 miles should be good as well.

30–40 meters

You can expect DX openings during local evening, nighttime, and sunrise hours, limited by high noise levels due to thunderstorms along the signal path. Peak conditions occur toward the east around midnight and in other directions just before sunrise. Short-skip up to 1000 miles should occur during daylight hours, and 500–2300 miles at night is likely.

80 meters

Some short-skip propagation of 250 miles or so may occur during daylight hours and to

EASTERN UNITED STATES TO:												
GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA							20	20				
ARGENTINA	10/15	20	20	20	20						10/15	10/15
AUSTRALIA	15	15	15/20	15/20	40/80	40/80	20					15
CANAL ZONE	15	20	20	20	40	40	20	20	20		10	15
ENGLAND	20	20	20		40						20	20
HAWAII	15	15	15/20	20	40/80	40/80						15
INDIA	20	20										
JAPAN							20	20				
MEXICO	15	20	20	20	40/80	40/80	20	20	20		10	15
PHILIPPINES	15	15	15/20	15/20	40/80	40/80	20					
PUERTO RICO	15	20	20	20	40	40	20	20	20		10	15
RUSSIA (C.I.S.)	20	20										20
SOUTH AFRICA		40/80	40/80	20	20	20	20				20	20
WEST COAST	40/80	40/80	40/80	40/80	40/80	40/80	40/80		10/20	10/20		
CENTRAL UNITED STATES TO:												
ALASKA							40/30	20				
ARGENTINA	15/20	20/40	20/40								15	15/20
AUSTRALIA	15			20	20/40	20/40	20/40					15
CANAL ZONE	20	20	20	40/80	40/80		20	20	15	15	10	10
ENGLAND	20	20	20/30	40	40		20	20				20
HAWAII	15	15	20	20	20/40	40	40	20	20			15
INDIA			20	20								
JAPAN						40/60	40/80	20	20			
MEXICO	20	20	20	40/80	40/80		20	20	15	15	10	10
PHILIPPINES	15			20	20/40	20/40	20/40					15
PUERTO RICO	20	20	20	40/80	40/80		20	20	15	15	10	10
RUSSIA (C.I.S.)	20	20	20					20				20
SOUTH AFRICA				20/40	20/40	20						
WESTERN UNITED STATES TO:												
ALASKA					20	20	40/80	20	20			
ARGENTINA	15/20	15/20	20	20	40	40						15
AUSTRALIA	15	15	15	20	20		40/80	20/40	20			
CANAL ZONE	10/15	15/20	15/20	20/40	40	40		20	20			10
ENGLAND	20	20										
HAWAII	15	15	15	20	20/40	20/40	40		20	20		
INDIA								20	20			
JAPAN				20	20	40/80	40/80		20	20		
MEXICO	10/15	15/20	15/20	20/40	40	40		20	20			10
PHILIPPINES	15	15	15	20	20		40/80	20/40	20			
PUERTO RICO	10/15	15/20	15/20	20/40	40	40		20	20			10
RUSSIA (C.I.S.)	20	20	20					20	20			20
SOUTH AFRICA				20	20							
EAST COAST	40/80	40/80	40/80	40/80	40/80	40/80	40/80		10/20	10/20		

NEVER SAY DIE
continued from page 59

A clipping from Frank KD4DZI says that FCC Chairman Kennard is pushing for a system that would permit the licensing of low power broadcasting stations which could cover a radius of two to six miles. Hark, what is that knocking sound? Good heavens, it's not the radiator pipes, it's the knock of opportunity for any amateurs with initiative.

No, I'm not talking about changing your living room into a broadcasting studio, I'm talking about the tens of thousands of religious and other special interest groups who will want to take advantage of the opportunity to reach out into their communities with their messages. They're going to need a lot of help in getting the equipment they need, connecting it together, setting up the antennas, and maintaining everything. And that could provide a whole new industry.

Companies like Ramsey will certainly be out there with transmitters. But there's going to be a need for small operating consoles, "on the air" signs, and so on. They're going to need CD, cart, LP, and cassette players, and so on. The more progressive may want to convert their dining room into a studio, complete with a grand piano, so they'll need help in the design and soundproofing of the room.

My recording studio was built with no two surfaces parallel, so there are no resonances. And one wall is made of doors with mirrors on one side and foam sound-absorbent material on the other so the ambiance of the room is adjustable. We're in the digital sound age, so the studios, microphones, and everything in the line has to be as perfect as possible.

Any good studio has to have a grand piano, naturally. My recording star, Scott Kirby, tried out a couple dozen grands at the Boston Steinway store before finding a Korean Young Chang piano that he felt outperformed anything else they had. It has a fantastically brilliant high end which is critically important for the music of Joplin and Gottschalk.

When the FCC chairman says he's pushing for a new service, it's time to start laying plans for taking advantage of what will probably come. Or you can watch a ball game.

More Health News

Yeah, this is supposed to be a ham radio magazine, so why am I annoying you with all this health crap? Two reasons. First, I seriously doubt that you are going to find out about most of the health stuff I write about unless I annoy you with it. Secondly, you are much more than a subscriber to me. When I find out something that could make your life happier, I feel obligated to do my best to let you know about it. I guess it's part of a genetic fault that makes me want to share anything which I particularly enjoy with as many people as I can.

So I keep after you to listen to classical music. To learn to ski. To try scuba diving. I still remember the day I discovered Beethoven's Sixth Symphony. I bought the album, put it on the record player, turned up the volume, and played it endlessly with my head right next to the speaker. Or the many times while I was in the navy in San Francisco that I played Chabrier's España at the USO on Geary Street. I still love those pieces.

Perhaps I'm feeling a little defensive. I got an E-mail from a chap who bitched about my despoiling a ham magazine with health information. Didn't have the guts to give his call. Fortunately for my peace of mind, the encouraging letters and E-mail are almost all positive. Thank you!

Now, down to the meat. Aspartame. Again. This is important enough so I've put together a four page pamphlet on the subject, but the message is clear — if you drink diet drinks or eat foods containing aspartame, a.k.a. NutraSweet, Equal, Spoonful, you can cause yourself some very serious health problems.

The recent escalation in multiple sclerosis cases has been traced to aspartame. It can cause similar symptoms, but when people stop using aspartame, the symptoms gradually go away. Not so with lupus, which has also been traced to aspartame. Stopping does not result in any improvement — it just stops the lupus from getting worse.

If you suffer from fibromyalgia symptoms, numbness in your legs, spasms, shooting pains, headaches, vertigo, dizziness, tinnitis, anxiety attacks, blurred vision, slurred speech, or memory loss, you probably have aspartame disease. It's also been tied to the dramatic increase in Alzheimer's Disease and Parkinson's. Are you using that little blue package for your coffee?

So what's going on here that's causing all the trouble? When the temperature of aspartame goes above 86° F (as it does in your stomach), the wood alcohol in aspartame converts to formaldehyde and then to formic acid. This causes metabolic acidosis. Formic acid is the poison used by fire ants. The methanol toxicity mimics multiple sclerosis.

I should mention that it also causes birth defects.

Yes, aspartame is supported by the FDA and AMA. Of course, that's where the money is. So who can you trust? Lawyers? Doctors? Dentists (think amalgam fillings)? Politicians? The police? The IRS? Clinton? Ted Kennedy (hey, tell us about Mary Jo, Ted!)? Any branch of the government? I don't ask you to trust me on anything I say, but I do give you reliable references to back me up. Turn off that damned TV and start reading.

You can get copies of my four page aspartame booklet to read and give to anyone you care about. Please help me get the word out on this menace that Monsanto has unleashed on us. Send me $1 and an SASE and I'll send you three booklets. That'll get you started.

July 1999

SUN	MON	TUE	WED	THU	FRI	SAT
				1 F	2 F-G	3 G
4 G	5 G	6 G	7 G-F	8 F	9 F	10 F
11 F	12 F-P	13 P	14 P	15 P	16 P	17 P-F
18 F-G	19 G	20 G	21 G	22 G-F	23 F	24 F-G
25 G	26 G-F	27 F	28 F-G	29 G-F	30 F	31 F-P

2,000 miles or so at night, but *no* daytime DX will take place due to signal absorption. During hours of darkness and just before sunrise, however, DX is possible to some areas of the world.

High noise levels due to thunderstorms along the signal path will limit both short-skip and DX communication.

160 meters

No daytime propagation expected, but some DX and short-skip propagation should take place at night in spite of high static noise levels.

Number 62 on your Feedback card

Barter 'n' Buy

Turn your old ham and computer gear into cash now. Sure, you can wait for a hamfest to try and dump it, but you know you'll get a far more realistic price if you have it out where 100,000 active ham potential buyers can see it, rather than the few hundred local hams who come by a flea market table. Check your attic, garage, cellar and closet shelves and get cash for your ham and computer gear before it's too old to sell. You know you're not going to use it again, so why leave it for your widow to throw out? That stuff isn't getting any younger!

The *73* Flea Market, Barter 'n' Buy, costs you peanuts (almost)—comes to 35 cents a word for individual (noncommercial!) ads and $1.00 a word for commercial ads. Don't plan on telling a long story. Use abbreviations, cram it in. But be honest. There are plenty of hams who love to fix things, so if it doesn't work, say so.

Make your list, count the words, including your call, address and phone number. Include a check or your credit card number and expiration. If you're placing a commercial ad, include an additional phone number, separate from your ad.

This is a monthly magazine, not a daily newspaper, so figure a couple months before the action starts; then be prepared. If you get too many calls, you priced it low. If you don't get many calls, too high.

So get busy. Blow the dust off, check everything out, make sure it still works right and maybe you can help make a ham newcomer or retired old timer happy with that rig you're not using now. Or you might get busy on your computer and put together a list of small gear/parts to send to those interested?

Send your ads and payment to: *73 Magazine*, Barter 'n' Buy, 70 Hancock Rd., Peterborough NH 03458 and get set for the phone calls. The deadline for the September 1999 classified ad section is July 10. 1999.

President Clinton probably doesn't have a copy of *Tormet's Electronics Bench Reference* but you should. check it out at **[www.ohio.net/~rtormet/index.htm]**—over 100 pages of circuits, tables, RF design information, sources, etc. BNB530

DFjr direction finder and MicroPLL programmable transmitter (formerly Agrelo) are now back under new management! Check exciting new accessories and upgrades. Order online at **www.swssec.com** or call SWS Security at 410-879-4035 (9-5 ET). BNB220

RF TRANSISTORS TUBES 2SC2879, 2SC1971, 2SC1972, MRF247, MRF455, MB8719, 2SC1307, 2SC2029, MRF454, 2SC3133, 4CX250B, 12DQ6, 6KG6A, etc. **WESTGATE**, 1 (800) 213-4563. BNB6000

Cash for Collins: Buy any Collins Equipment. **Leo KJ6HI.** Tel./FAX (310) 670-6969. [radioleo@earthlink.net] BNB425

MAHLON LOOMIS, INVENTOR OF RADIO, by Thomas Appleby (copyright 1967). Second printing available from **JOHAN K.V. SVANHOLM N3RF**. SVANHOLM RESEARCH LABORATORIES, P.O. Box 81, Washington DC 20044. Please send $25.00 donation with $5.00 for S&H. BNB420

METHOD TO LEARN MORSE CODE FAST AND WITHOUT HANGUPS Johan N3RF. Send $1.00 & SASE. SVANHOLM RESEARCH LABORATORIES, P.O. Box 81, Washington DC 20044 USA. BNB421

Great New Reference Manual with over 100 pgs of P/S, transistor, radio, op-amp, antenna designs, coil winding tables, etc. See details at [www.ohio.net/~rtormet/index.htm] or send check or M.O. for $19.95 + $2.00 P&H to RMT Engineering, 6863 Buffham Rd., Seville OH 44273. BNB202

QSL CARDS. Basic Styles; Black and White and Color Picture Cards; Custom Printed. Send 2 stamps for samples and literature. RAUM'S, 8617 Orchard Rd., Coopersburg PA 18036. Phone or FAX (215) 679-7238. BNB519

WANTED: High capacity 12 volt solar panels for repeater. **[kk4ww@fairs.org]** or (540) 763-2321. BNB2630

COLLOIDAL SILVER GENERATOR! Why buy a "box of batteries" for hundreds of dollars? Current regulated, AC powered, fully assembled with #12 AWG silver electrodes, $74.50. Same, but DC powered, $54.50. Add $2.50 shipping. **Thomas Miller**, 314 South 9th Street, Richmond IN 47374. BNB342

ASTRON power supply, brand-new w/warranty, RS20M $99, RS35M $145, RS50M $209, RS70M $249, **AVT**. Call for other models. **(626) 286-0118**. BNB411

Wanted: ICOM UX-R96 and UX97 plug-in modules for an ICOM 970. **Randy Ballard N5WV**, (903) 687-3002. BNB175

HEATHKIT COMPANY is selling photocopies of most Heathkit manuals. Only authorized source for copyright manuals. **Phone:** (616) 925-5899, 8-4 ET. BNB964

Electricity, Magnetism, Gravity, The Big Bang. New explanation of basic forces of nature in this 91-page book covering early scientific theories and exploring latest controversial conclusions on their relationship to a unified field theory. To order, send check or money order for $16.95 to: American Science Innovations, PO Box 155, Clarington OH 43915. Web site for other products [http://www.asi_2000.com]. BNB100

COLD FUSION! - FUEL CELL! - ELECTRIC BICYCLE! Each educational kit: (Basic - $99.95, Deluxe - $199.95, Information - $9.95.) CATALOG - $5.00. ELECTRIC AUTOMOBILE BOOK - $19.95. **KAYLOR-KIT**, POB 1550ST, Boulder Creek, CA 95006-1550. (831) 338-2300. BNB128

Wanted: ICOM IC-970. Must be in mint condition, non smoker. Also looking for the following ICOM sales brochures: IC-275, 575, 375 and 970. **Randy Ballard N5WV**, (903) 687-3002. BNB75

TELEGRAPH COLLECTOR'S PRICE GUIDE: 250 pictures/prices. $12 postpaid. **ARTIFAX BOOKS**, Box 88, Maynard MA 01754. Telegraph Museum: [http://wltp.com]. BNB113

LETTERS

continued from page 6

peaters in the United States, took an arbitrary average area of coverage, and came up with twenty million miles of three-dimensional coverage.

In the early to mid-sixties, many of my high school friends were on CB radio after school. They used their parents' radios to communicate in an "after school" and many times an "all night long" net. Was that the Family Radio Service of the sixties?

Wouldn't it be nice if we introduced the public to the fact that there is a whole other communications network that is free, uses the same size, shape, and style of radio they are using now, and requires a relatively simple test? That they can communicate almost anywhere in the United States and the world? That they can use their radio to communicate when normal communication channels (such as land line or cell phone) are out during a disaster? That they can even talk to the Space Shuttle?

And wouldn't it be nice if the public, when learning about this fantastic free ham radio, would learn that they could even connect their computers to their radios and use the computer to communicate without the need of phone lines? And what about all the other modes of operation available to amateur radio operators? Do you think that some interest may be generated once the public knew about it? I think so.

So, what are we missing here? We as the amateur radio community, hams, need to take advantage of the FRS communications frenzy and market to the public the fact that they can communicate "twenty million miles" using ham radio.

Clubs have to become active and place listings in community newspapers. "Family Radio Service = 2 miles. Amateur Radio Service = 20,000,000 miles. Learn how!"

Set up "public information booths" at the local malls.

Place club and licensing information at local electronics stores.

Get back into the schools and let the students know about ham radio. Explain how repeaters will allow them to communicate with their friends even if they are at the baseball game.

As individuals, carry some ham radio promotional material with you explaining about the hobby. Pass this information to families you see using the FRS. Believe me, they won't bite you!

Each year in recent history, we have seen the dwindling of the number of amateur radio operators. We have the ability to convert many Family Radio Service users to Amateur Radio Service users.

Let's do it!

Here are some of the books Wayne has written. Some can change your life, if you'll let them. If the idea of being healthy, wealthy and wise is of interest to you, start reading. Yes, you can be all that, but only when you know the secrets which Wayne has spent a lifetime uncovering.

Radio Bookshop

The Secret Guide to Health: Yes, there really is a secret to regaining your health and adding 30 to 60 years of healthy living to your life. The answer is simple, but it means making some very difficult changes. Will you be skiing the slopes of Aspen with me when you're 90 or doddering around a nursing home? Or pushing up daisies? No, I'm not selling any health products. $5 (H)

The Secret Guide to Wealth: Just as with health, you'll find that you have been brainwashed by "the system" into a pattern of life that will keep you from ever making much money and having the freedom to travel and do what you want. I explain how anyone can get a dream job with no college, no résumé, and even without any experience. I explain how you can get someone to happily pay you to learn what you need to know to start your own business. $5 (M)

The Secret Guide to Wisdom: This is a review of around a hundred books that will help you change your life. No, I don't sell these books. They're on a wide range of subjects and will help to make you a very interesting person. Wait'll you see some of the gems you've missed reading. $5 (B)

Cold Fusion Overview: This is both a brief history of cold fusion, which I predict will be one of the largest industries in the world in the 21st century, plus a simple explanation of how and why it works. This new field is going to generate a whole new bunch of billionaires, just as the personal computer industry did. $5 (C)

The Bioelectrifier Handbook: This explains how to build or buy a little electrical gadget that can help clean the blood of any virus, microbe, parasite, fungus or yeast. The process was discovered by scientists at the Albert Einstein College of Medicine, patented, and then hushed up. It's curing AIDS, hepatitis C, and a bunch of other serious illnesses. The circuit can be built for under $20 from the instructions in the book. $10 (A)

Moondoggle: After reading René's book, *NASA Mooned America*, I read everything I could find on our Moon landings. I watched the videos, looked carefully at the photos, read the astronaughts' biographies, and talked with some of my readers who worked for NASA. This book cites 25 good reasons I believe the whole Apollo program had to have been faked. $5 (D)

Mankind's Extinction Predictions: If any one of the experts who have written books predicting a soon-to-come catastrophe which will virtually wipe us all out are right, we're in trouble. In this book I explain about the various disaster scenarios, from Nostradamus, who says the poles will soon shift, wiping out 97% of mankind, to Sai Baba, who had recently warned his followers to get out of Japan and Australia before March 6th this year. The worst part of these predictions is the accuracy record of some of the experts. Will it be a pole shift, a new ice age, a massive solar flare, a comet or asteroid, or even Y2K? I'm getting ready, how about you? $5 (E)

Wayne's Submarine Adventures in WWII: Yes, I spent from 1943-1945 on a submarine, right in the middle of the war with Japan. We almost got sunk several times, and twice I was in the right place at the right time to save the boat. What's it really like to be depth charged? And what's the daily life aboard a submarine like? There are some very funny stories. If you're near Mobile, please visit the Drum. $5 (S)

Improving State Government: Here are 24 ways that almost any state government can cut expenses enormously, while providing far better services. I explain how any government bureau or department can be gotten to cut its expenses by at least 50% in three years and do it cooperatively and enthusiastically. I explain how, by applying a new technology, the state can make it possible to provide all needed services without having to levy *any* taxes at all! Read the book, run for your legislature, and let's get busy making this country work like its founders wanted it to. Don't leave this for "someone else" to do. $5 (L)

Travel Diaries: You can travel amazingly inexpensively – once you know the ropes. Enjoy Sherry and my budget visits to Europe, Russia, and a bunch of other interesting places. How about a first class flight to Munich, a rented Audi, driving to visit Vienna, Krakow in Poland (and the famous salt mines), Prague, back to Munich, and the first class flight home for two, all for under $1,000. Yes, when you know how you can travel inexpensively, and still stay in first class hotels. $5 (T)

Wayne's Caribbean Adventures: More budget travel stories - where I visit the hams and scuba dive most of the islands of the Caribbean. Like the special Liat fare which allowed us to visit 11 countries in 21 days, with me diving all but one of the islands, Guadeloupe, where the hams kept me so busy with parties I didn't have time to dive. $5 (U)

Silver Wire: With two 3-in. pieces of heavy pure silver wire + three 9V batteries you can make a thousand dollars worth of silver colloid. What do you do with it? It does what the antibiotics do, but germs can't adapt to it. Use it to get rid of germs on food, for skin fungus, warts, and even to drink. Read some books on the uses of silver colloid, it's like magic. $15 (Y)

Classical Music Guide: A list of 100 CDs which will provide you with an outstanding collection of the finest classical music ever written. This is what you need to help you reduce stress. Classical music also raises youngsters' IQs, helps plants grow faster, and will make you healthier. Just wait'll you hear some of Gotschalk's fabulous music! $5 (Z)

Reprints of My Editorials from *73*.

Grist I: 50 of my best non-ham oriented editorials from before 1997. $5 (F)

Grist II: 50 more choice non-ham editorials from before 1997. $5 (G)

1997 Editorials: 240 pages, 216 editorials discussing health, ideas for new businesses, exciting new books I've discovered, ways to cure our country's more serious problems, flight 800, the Oklahoma City bombing, more Moon madness, and so on. In three $5 volumes. $15 (O)

1999 Jan-Aug Editorials: 188 pages in two $5 volumes. Bringing you up to date. $10 (P)

Ham-to-Ham: 45 of my ham-oriented editorials. These will help you bone up on ham history. Great stuff for ham club newsletter filler. Yes, of course these are controversial. $5 (Q)

$1 Million Sales Video: How to generate extra million in sales using PR. This will be one of the best investments your business ever made. $43 (V)

One Hour CW: Using this sneaky method even *you* can learn the Morse Code in one hour and pass that dumb 5wpm Tech-Plus ham test. $5. (CW)

Code Tape (T5): This tape will teach you the letters, numbers and punctuation you need to know if you are going on to learn the code at 13 wpm or 20 wpm. $5 (T5)

Code Tape (T13): Once you know the code for the letters (T5) you can go immediately to copying 13 wpm code (using my system). This should only take two or three days. $5 (T13)

Code Tape (T20): Start right out at 20 wpm and master it in a weekend for your Extra Class license. $5 (T20)

Code Tape (T25): Same deal. It doesn't take any longer to handle 25 wpm as it does 13. Or use the ARRL system & take six months.$5 (T25)

Wayne Talks at Dayton: This is a 90-minute tape of the talk I'd have given at the Dayton, if invited. $5 (W1)

Wayne Talks at Tampa: This is the talk I gave at the Tampa Global Sciences conference. I cover cold fusion, amateur radio, health, books you should read, and so on. $5 (W2)

Stuff I didn't write, but you need:

NASA Mooned America: René makes an air-tight case that NASA faked the Moon landings. This book will convince even you. $25 (R1)

Last Skeptic of Science: This is René's book where he debunks a bunch of accepted scientific beliefs – such as the ice ages, the Earth being a magnet, the Moon causing the tides, and etc. $25 (R2)

Elemental Energy Subscription: I predict this is going to be the largest industry in the world in about 20-30 years. They laughed at me when I predicted the personal computer growth in 1975. PCs are now the third largest industry in the world. The elemental energy ground floor is still wide open, but then that might mean giving up watching ball games and talk shows on the boob tube. $30 for six issues. (EE). A sample issue is $10.

Three Gatto Talks: A prize-winning teacher explains what's wrong with American schools and why our kids are not being educated. Why are Swedish youngsters, who start school at 7 years of age, leaving our kids in the dust? Our kids are intentionally being dumbed down by our school system — the least effective and most expensive in the world. $5 (K)

......*Wayne*

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73 Amateur Radio Today

JULY 1999
ISSUE #465
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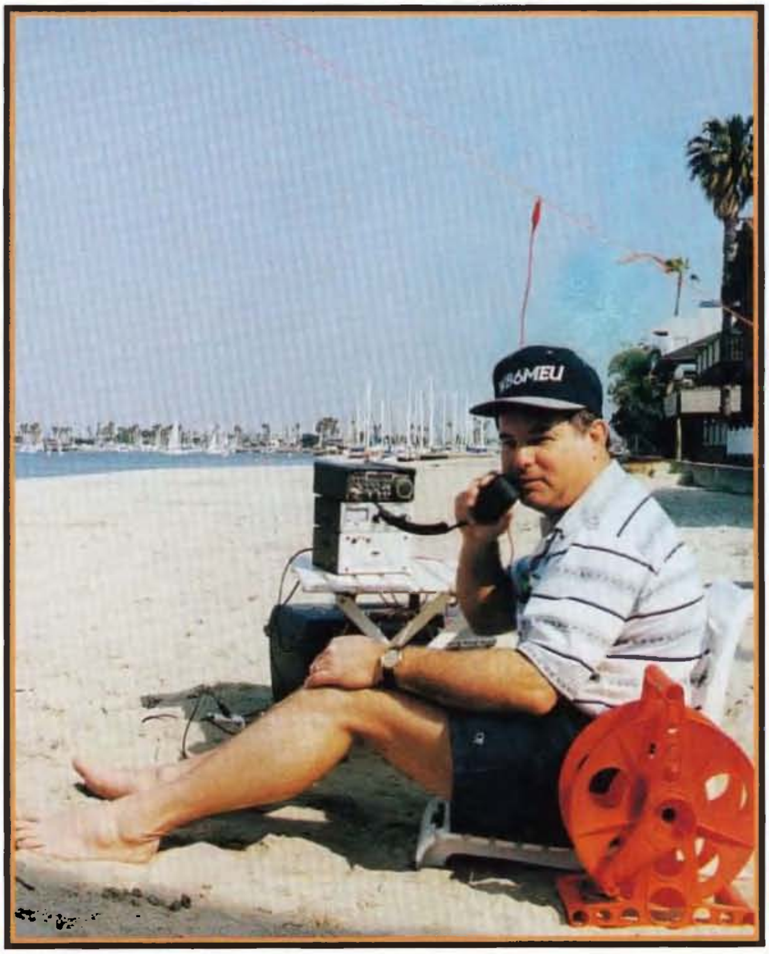

Tough life — page 39

JULY 1999
ISSUE #465

73® Amateur Radio Today

TABLE OF CONTENTS

FEATURES

REVIEW

DEPARTMENTS

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On the cover: It's a tough station, but somebody has to man it. Article begins on page 39. We are always looking for interesting articles and cover photos — with or without each other. Your name could be in this space *next* month, and our check could be on its way to *you!* You couldn't use a little extra cash?

Feedback: Any circuit works better with feedback, so please take the time to report on how much you like, hate, or don't care one way or the other about the articles and columns in this issue. G = great!, O = okay, and U = ugh. The G's and O's will be continued. Enough U's and it's Silent Keysville. Hey, this is *your* communications medium, so don't just sit there scratching your...er...head. FYI: Feedback "number" is usually the page number on which the article or column starts.

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Number 1 on your Feedback card

NEVER SAY DIE

Wayne Green W2NSD/1

Why You Get Sick

The *cause* of *all* sickness is really very simple, as is the *cure* for *all* illness. The $1.5 trillion American medical industry, with its chemo, radiation, bypass operations, and million-dollar machines is mostly nonsense. Let me explain this in simple terms and see if it doesn't make sense to you.

When you drink enough whiskey you get drunk, right? Okay, so what kind of a pill, shot, vitamin, herb concoction, food supplement, or surgery will sober you up as long as you continue to drink?

Think of the billions of dollars that the medical industry is spending on research for a pill they can patent and sell you to cure drunkenness. Or call it cancer, arthritis, heart trouble, stroke, Alzheimer's, Parkinson's, depression, attention deficit disorder, multiple sclerosis, lupus, diabetes, AIDS, and so on.

My *Secret Guide to Health* exposes this dirty secret and explains how you can stop making yourself sick. What kind of a business would the medical industry be if all it had to do was repair the damage done by accidents and muggings? Pffft goes the pharmaceutical industry. No more nursing homes. We'd need 90% fewer hospitals and doctors. And fewer lawyers. And insurance companies. And HMOs.

If I can get you to stop doing the things that are causing you to get sick, you'll get well. Sickness isn't caused by God, Mother Nature, satan, or even bad luck. It's caused 100% by you.

My *Guide*, which would be a huge bargain at $5,000, is just $5 ($3 s/h). I hope you'll read it and then get copies for your family and friends. If we can get the word around, we can virtually destroy the medical industry, as well as the food giants, the milk industry, and so on.

More Mooning

If you think Wayne was like a broken record (for those of you old enough to remember records) about the Moon hoax, you ain't seen nothin' yet. Now I'm arming myself with a whole new bunch of facts, courtesy of *Dark Moon*, a new book from England.

Like the study done by David Groves Ph.D. on the Ektachrome film used by our Moon walkers. He found three major problems. First, the film clouds up and loses contrast rapidly when exposed to x-ray radiation, as we might expect. The amount of this radiation, once one is no longer protected by the Van Allen belt, is not only deadly to living things, but is enough to completely ruin film. Cameras would have to have at least six inches of lead to protect any film. Our astronauts used somewhat modified Hasselblad cameras. No lead.

Then there's the temperatures. It's about 300° in the sun and –200° in the shade. The working range of Ektachrome is far, far short of those extremes. When cold, the film becomes brittle and breaks. When hot, it melts.

I've seen how well composed and exposed the Moon photos were. The surprising thing is that the cameras they used had no viewfinders, nor any way to adjust the exposures for light conditions or focus. Further, the cameras were fastened to the chests of the astronauts, so they had to point them by moving their bodies, yet the resulting photos came out just as if they'd been taken under studio conditions. And some were taken from ten feet above the ground! Hmm, how'd they *do* that?

But that's just one little tidbit I pulled from the inexhaustible supply in this 568-page book. The authors have gone over every shred of evidence and nailed NASA endlessly in lies. NASA has understandably refused to answer any of their many questions.

If you're interested, I've got some copies available for $35 ($3 s/h). It isn't yet available from Amazon or Barnes & Noble, so I had some flown over from London for you. Be the first on your block to get one.

Closed Windows

It must be very frustrating for you for me to keep pushing you to try new things and to make changes in your life. A recent study, published in *The New Yorker*, reported that only young people are amenable to change, or contribute much in the way of creativity to our world. The truly creative work in art, music, and science is being done by young people.

If you haven't been introduced to classical music before you are 30, the odds are 95% that you aren't ever going to go for it. Ditto learning to like (or even try, for that matter) any new foods, wearing different clothes, or accepting new scientific ideas.

In study after study of creativity, age has turned out to be a leading factor in its decline. The profession of mathematics is founded almost entirely on the creative breakthroughs of brilliant youngsters. This holds, too, for composers, poets, and scientific research. Older minds are not only less likely to generate anything new, they're less open to accept new ideas from anyone else.

All of the major amateur radio developments and pioneering were done by youngsters. I was there and knew most of 'em. The League put a stop to that nonsense 35 years ago.

So here I am, doing my best to get you interested in new ideas — and wondering why I'm going over like a lead balloon. If I could get you to change to a raw food diet I could help you get over any illness you have and lose weight until you are back to normal. But hell will have to freeze over first. I should be writing for *Boy's Life* and *Seventeen*, I suppose.

I love new ideas, and I've made major changes in my lifestyle, but then I'm just probably in my second childhood. Can I get you to join in my games? Hmm, I thought not.

Leptons

Bob Shrader W6BNB, who is retired and apparently has far too much time on his hands, decided to try to bring himself up to date on the makeup of the atom. A lot has changed since his (and my) college physics courses. It used to be that the atom was made up of protons, electrons, and neutrons. And that worked just fine.

Bob recently sent me a paper which pretty well sums up what's happened since we went to college, complete with mesons, baryons, six kinds of quarks, hadrons, leptons, muons, photons, phonons, gluon forces, tau particles,

Continued on page 57

Number 6 on your Feedback card

QRX . . .

FISTS vs. ARRL

While all eyes are now on the FCC regarding the future of ham radio, FISTS—the British Morse code preservation society, with a chapter in the United States—is very critical of the recent ARRL ham radio restructuring proposal. In part two of her interview with *Amateur News Weekly*'s Charlie Cotterman KA8OQF, FISTS' Nancy Kott WZ8C said that the ARRL is not adequately supporting Morse code.

... I think that by telling the FCC that it is OK to lower the requirements 12 WPM and by giving away some of our CW subbands to the sideband portion of the band. I think that they are setting a precedent and [things] can only get worse. ...

What is FISTS' position on the ARRL proposal?

... FISTS is not against restructuring, but as the international Morse preservation society we are against the lowering of standards as they apply to Morse code. Of course, we are against the proposed loss of some of our CW frequencies. ...

Should the Amateur Community make their individual opinions in this situation known? And who should they make them known to?

... We should definitely raise our voices and let our opinions be known about this. I would urge everybody to let their ARRL leadership know how they feel. Write your director and the president and the vice president of the ARRL. Let them know how you feel, because they are supposed to be representing the majority of the hams. ...

The storm that is brewing on the horizon has the distinct flavor of the ones that happened during the changeover to incentive licensing ... and the introduction of the codeless entry license to the ham ranks.

Tnx and a big clenched one to the South Jersey Radio Association's *Harmonics*, September 1998, John Buzby W2BU, editor.

For Sale

Or, how to use the classifieds to dig a hole with an FT-101.

MONDAY. For sale: R.D. Jones has one FT-101 radio for sale. Phone after 7:00 p.m. and ask for Mrs. Kelly, who lives with him. Cheap.

TUESDAY. We regret having erred in R.D. Jones' ad yesterday. It should have read: One FT-101 radio, cheap. Phone and ask for Mrs. Kelly, who lives with him after 7:00 p.m.

WEDNESDAY. R.D. Jones has informed us that he has received several annoying phone calls because of the error we made in yesterday's classified ad. The ad stands correct as follows—For sale: R.D. Jones has one FT-101 radio for sale cheap. Phone after 7:00 p.m. and ask for Mrs. Kelly who loves with him.

THURSDAY. I, R.D. Jones, have no FT-101 radio for sale. I smashed it. Don't call again, as I have had the phone disconnected. I have not been carrying on with Mrs. Kelly. Until yesterday, she was my housekeeper but she quit!

All this goes to prove that a swapmeet might be the safest way to sell your unwanted gear.

Tnx and a one outta two ain't bad, at least he coulda kept the rig to the VK6 Radio Oldtimers Club, via the *marcKey*, newsletter of the Manteca (CA) ARC, Cathy Ledbetter KE6UTO, editor.

Laws for the Common Man

The famous Murphy's Law—If anything can go wrong, it will—is said to have entered history in 1949 at Edwards Air Force Base, when a malfunctioning strap transducer moved one Captain Murphy to his highest eloquence. Other truths attributed to Captain Murphy are: Nothing is ever as simple as it seems. Everything takes longer than you expect. And, left to themselves, things always go from bad to worse.

Since Murphy's extraordinary leap into immortality, many imitators have sought in similar manner to plumb the human condition. Perhaps the most successful was British historian C. Northcote Parkinson, who found that work expands to fill the time allotted to it. Next in notoriety is the (Lawrence) Peter Principle, that in every hierarchy each employee tends to rise to his own level of incompetence.

Lesser known, but just as penetrating, are all of the slippery laws of money. Those and other pearls have been collected by Paul Dickson, whose book, *The Official Rules*, has been published by Delacorte Press.

For example, there's Parkinson's Second Law, which states that expenditures rise to meet income. Further refined by Dunn's Discovery—that the shortest measurable interval of time is the time between the moment you put a little extra aside for a sudden emergency and the arrival of that emergency.

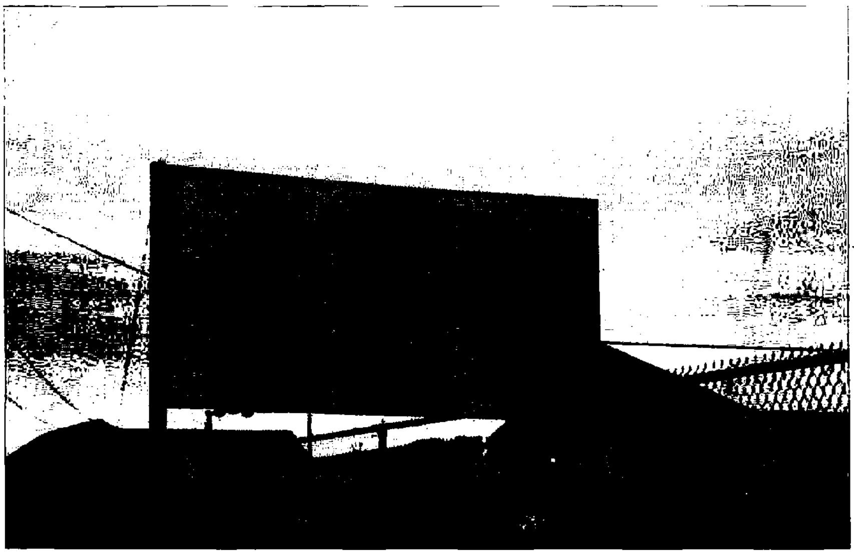
This state of affairs is summed up in Gumperson's Law: After a rise in salary, you will have less money at the end of each month than you had before. With regard to products, Graditor's Laws: (1) If it can break it will, but only after the warranty expires, and (2) A necessary item goes on sale only after you have purchased it at the regular price. To which you may add Dyer's Discovery: It's easy to tell when you've got a bargain—it doesn't fit. And Herblock's Law: If it's good, they'll stop making it.

Car owners are well acquainted with Hartman Automotive Laws: (1) Nothing minor ever happens to a car on the weekend. (2) Nothing minor ever happens to a car on a trip. (3) Nothing minor ever happens to a car.

Which brings me to Samuel Goldwyn's Law of Contracts: A verbal contract isn't worth the paper it's written on. Law-giving actually precedes Murphy by a good many centuries. Samuel Butler knew that all progress is based on the innate desire for every organism to live beyond its income. Josh Billings similarly admonished: Live within your income, even if you have to borrow to do it.

Another great name in the field is Finagle. His unique contributions came in the area of science,

Continued on page 42



Tnx to Jim Kocsis WA9PYH of South Bend IN for sending in this photo of every OM's dream store. Let's see ... down Aisle 2, in between the Spackle and the Sprinklers ... you'll find the Spelling department?

Emergency Power for Hams

... including your own experimental wind generator.

Thomas Miller WA8YKN
314 South 9th Street
Richmond IN 47374

Last year was a record one for violent weather around the world. Weather-related disasters in 1998 cost a staggering 89 *billion* dollars, more than for the *entire decade* of the '80s. Three hundred million homes were destroyed by violent weather in 1998, and over 32,000 people lost their lives. If the first months of 1999 were any indication, this trend is going to continue. Add to this the increase in earthquake and volcanic activity, satellite-eating solar flares from cycle 23, and the possibility of power and communications disruptions due to the Y2K computer problem, and we may be in for a wild ride into the next millennium.

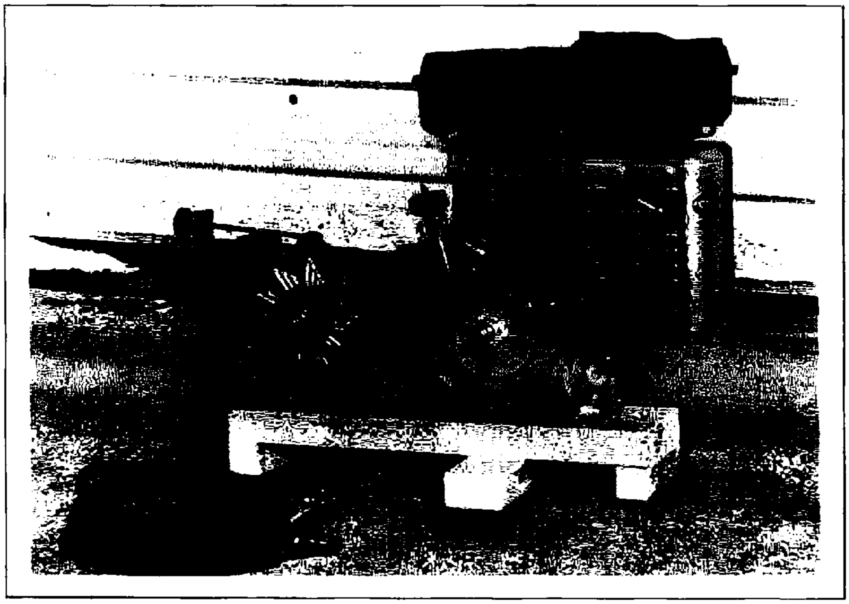


Photo A. A gas engine, an automobile alternator, and a few scraps of wood and angle iron can be assembled into the ultimate battery charger.

We may think of amateur radio as an exciting and challenging hobby, but in truth we're an *emergency service*. When a disaster strikes, electrical power and telephone service may be disrupted over a wide area for days or weeks. Amateur radio operators must be ready to step in and provide communications for police, fire, and rescue services. In a time when the government is desperately selling off every available scrap of radio spectrum to commercial interests, amateur radio has survived and prospered simply because of our ability to help the public in times of emergency. It's our job, and nobody does it better.

The missing link: emergency power

The radio equipment we use on a daily basis can easily be pressed into emergency service, and any ham worth his salt can cut a wire to resonance and rig a makeshift antenna. Unfortunately, the electrical grid is usually the first thing to fail in an emergency, and very few amateur stations are equipped to operate without commercial power. If we are to do our part and justify the frequency spectrum we occupy, we should strive to get as many amateur

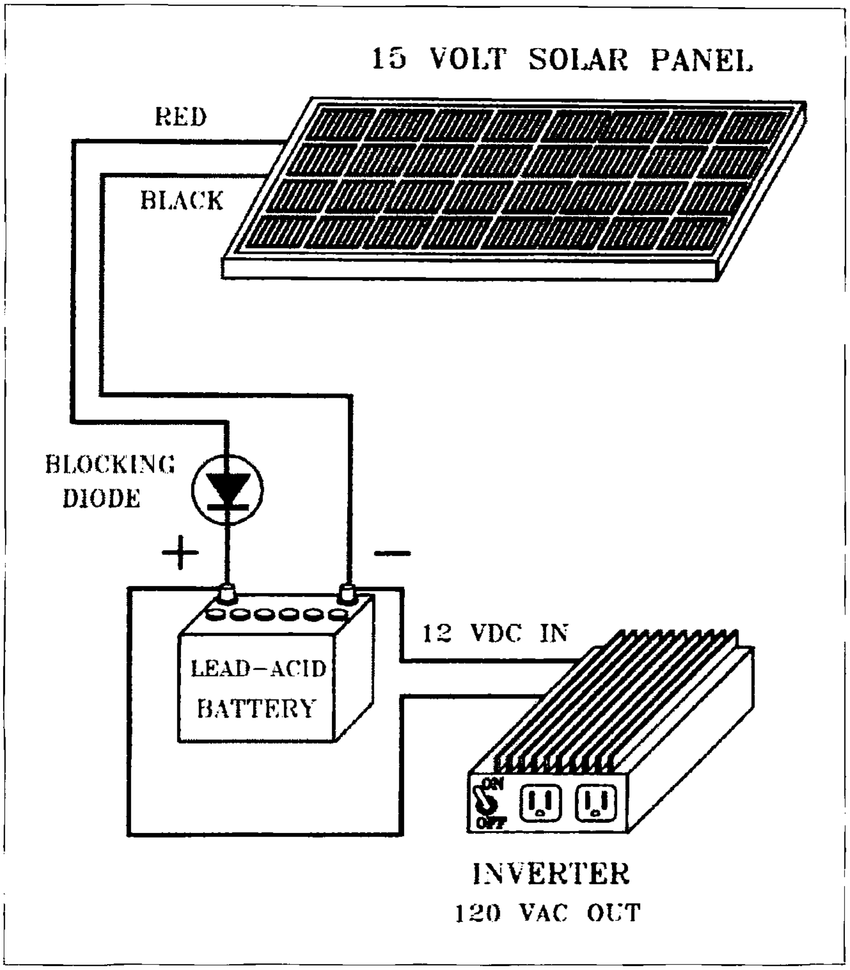


Fig. 1. Photovoltaic panels keep the batteries charged and ready to provide 12 volt DC power for emergency communications. By using an inverter, 120 volt AC power is available as well.

radio stations as possible ready to operate from some form of emergency power. With hams lining up to buy new HF rigs costing several thousand dollars apiece, it shouldn't be too much to spend a fraction of that amount to keep that equipment on the air when it's needed most.

Batteries: the heart of the system

When most people think of emergency power, they think of a gasoline-powered generator to produce 120 volts AC. While this may be the correct approach for powering motors and large appliances, it's not the best choice for powering communications equipment. Consider that a small engine will consume about a gallon of gasoline per hour, so even a full 55-gallon drum of gas will be empty in two days. Unless you plan on a very short disaster, we need a power source better suited to long-term, low current service with occasional high current peaks. You may want a generator for other purposes, but since most amateur radio equipment in use today operates from a 12 volt DC power source, it makes more sense to begin with a good set of batteries.

If your current requirements are very low, a single large automotive battery may be adequate. However, the plates in automotive batteries are made from a sponge-like form of lead to increase the surface area, and will warp and short under long-term high current operation. A much better source is the *deep cycle* battery. These have plates designed for steady discharge followed by rapid recharging, and will last many

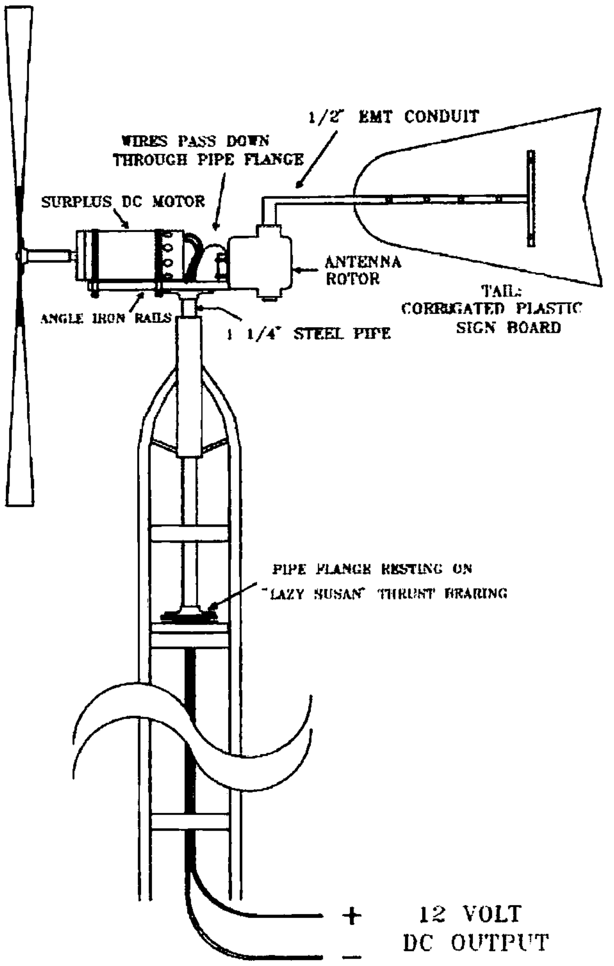


Fig. 2. In some locations, the wind blows more often than the Sun shines. A wind generator can be built from a surplus DC motor to keep the batteries charged and ready for an emergency.

times longer than the automotive battery in this type of service.

A common type of deep cycle battery is the marine battery designed for use with electric trolling motors. Marine batteries are easy to find, and usually cost about a third more than the standard automotive batteries. While not in quite the same class as industrial batteries used in lift trucks and other electric vehicles, they do seem to work well under the type of loads encountered in the Amateur Radio Service.

If possible, try to find a type with removable caps. Many batteries sold today are sealed, and supposedly "maintenance free." What this really means is that there is *no way* to maintain them, so you are expected to throw them away and replace them every now and then. In emergency service, where it will be necessary to keep them at full charge for long periods of time, it's far better to be able to check the electrolyte level and monitor the state of the individual cells with a hydrometer. This means that you have to be able to access the electrolyte.

Another reason to find non-sealed batteries is electrolyte additives. The biggest reason for battery failure is due to the buildup of sulfates on the battery plates. There are additives available that will prevent sulfates from forming. In fact, adding a small amount to each battery cell will actually remove sulfate buildup from an old battery, sometimes restoring it to useful service. Battery additives such as VX-6 or CHARGE-IT can be found in auto parts stores, or obtained by mail from J.C. Whitney.

Installing your battery bank

While a single battery may be enough for your needs, you can increase the available current by connecting two or more in parallel. If you do this, you should find batteries of the same size and type, which of course won't be a problem if you buy them at the same time.

Since lead-acid batteries produce hydrogen gas, it's not a good idea to have a bank of them cooking off in your basement right next to the furnace. A better choice might be the garage, or a small shed located away from the house. Wherever you decide to locate your batteries, plan to include a battery box with a vent to the outside to prevent hydrogen gas from building up to dangerous levels.

When running the power wires from the batteries to your equipment, don't forget to install a fuse! A large bank of batteries can store an incredible amount of energy, and an accidental short could release it all at once ... not unlike a stick of dynamite going off! Fuse your system at a safe level for the size wire used—for example, 30 amps for #10 AWG wire, 40 amps for #8 AWG, etc.

Charging the batteries

Since the purpose of emergency power is to operate when commercial power is unavailable, it's not enough to rely on the AC line to charge the batteries. If you have a gas-powered generator, you can use it to power a standard battery charger as needed. If you don't have a generator, you can easily build a suitable gas-powered battery charger using a small engine and an automobile alternator. A 3-1/2 horsepower lawnmower engine will drive a 60 amp alternator. A 5 horsepower engine will generate 100 amps or more. If you use a modern alternator with a built-in voltage regulator, wiring

is reduced to a connection from the alternator output to the positive battery terminal and a wire from the alternator case to the negative pole of the battery. It's also a good idea to add an ammeter in the positive lead to monitor the output current.

Automobile alternators are voltage-regulated, which is fine for batteries that are maintained at full charge. However, if you completely discharge the battery, a voltage-regulated system will attempt to charge the battery at the full output current of the alternator. Deep cycle batteries should be charged at about ten percent of the amp-hour rating. For example, a 200 amp-hour battery should be charged at 20 amps. The full output of a 100 amp alternator could be enough to damage the battery. If your battery bank is large enough to handle the alternator output, this won't be a problem. If you are using a smaller battery, you can series a few tenths of an ohm using a large ceramic power resistor or even the element from an electric heater to limit the current to a safe level. Add a knife switch or use a jumper cable to short across the resistor as the battery approaches full charge.

Older alternators without the built-in regulators can be controlled simply by inserting a resistor between the positive terminal and the field. By using a large rheostat, you can set the output current to any level you desire up to the full capability of the alternator. A 30 ohm 100 watt rheostat is a good place to start. This type of current-regulated system will not automatically limit the voltage once the batteries reach full charge, so if there are voltage-sensitive loads connected to the batteries, you will have to monitor the voltage and increase the rheostat resistance as needed to keep the voltage at a safe level.

"Free energy" sources

Although a gas-powered charging system is great for a quick, high-current boost, there are several disadvantages. Gasoline is dangerous to store, and doesn't keep well without special stabilizers. The constant sound of a small engine will quickly drive both

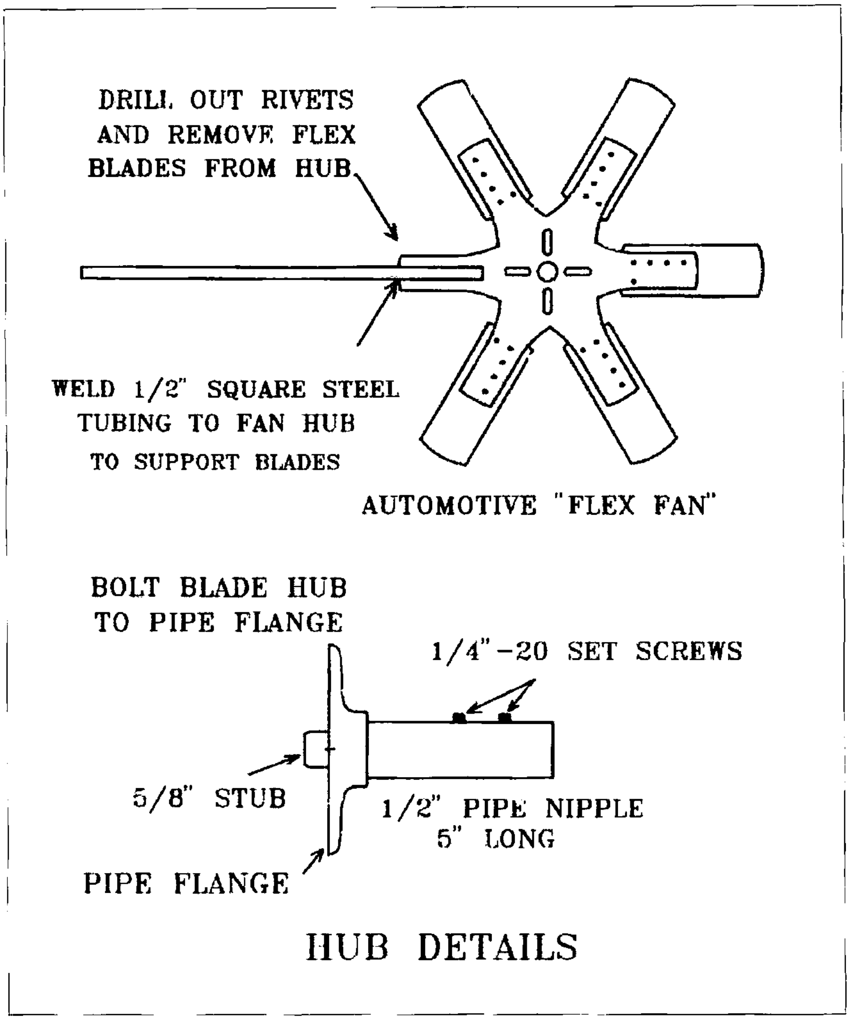


Fig. 3. The wind generator is built around a replacement automobile "Flex-Fan," six pieces of 1/2"-square steel tubing, and an arbor made from pipe fittings.

you and your neighbors crazy, undesirable at a time when stress is already high. Gas engines also produce exhaust, which can create a carbon monoxide hazard. The alternative is to charge your batteries with one or more natural energy sources. The two most common are solar and wind energy.

Fig. 1 shows a simple system consisting of a 15 volt photovoltaic panel connected through a reverse-blocking diode to charge a battery. More panels and batteries can be added in parallel to increase the available current. The diode, required to prevent the battery from discharging through the solar panel at night, must be rated for more current than the panel (or panels) can produce. Power can be taken directly from the battery for 12 volt DC loads, or the battery can drive an inverter to produce 120 volts AC to power lights and household appliances.

Photovoltaic panels have several advantages that make them worth considering. They have no moving parts to wear out, and they're completely silent in operation. It only requires two wires to hook them up, and operation is totally automatic. You can expect to get 20 years or more of useful service from a solar panel with no maintenance other than to keep it clean.

On the other hand, solar electricity is extremely expensive. New panels will cost around $150 per amp of charging current. Any major power requires the equivalent of shingling your house with five dollar bills! Also, this power is only available for a portion of each day, and even that is considerably reduced in bad weather.

Even with these disadvantages, a few solar panels may be worthwhile if only to keep your batteries fully charged. The small array shown in **Photo C** will produce 15 volts at 2 amps in full sunlight, and even on cloudy days will generate an amp or more. They have kept the main batteries fully charged for the past year without any problems. Once discharged, the solar array will bring the batteries up to full charge by themselves in about a week. A low-powered station, such as a Ten-Tec Argonaut and perhaps a two-meter HT, could be powered continuously using no more than a small marine battery and a solar panel or two.

Wind power

Here in Indiana, it seems that the wind blows a lot more often than the Sun shines. It makes sense to utilize some of this energy for our needs, especially if it's to augment the power generated through photovoltaic panels. Unlike solar energy, wind power works both night and day, rain or shine. While much more of a mechanical challenge than solar panels, a modest wind generator in a good location will generate five times the power for the same outlay of cash. Many ready-built wind generators are on the market in every conceivable size, with outputs from a few hundred watts up to many kilowatts. Prices start in the $400 range and go up sharply from there.

If you have a welder and some mechanical ability, a small wind generator is not really very difficult to build. **Fig. 2** shows an experimental generator built from odds and ends that is capable of producing 5 to 10 amps of charging current in a stiff breeze.

The heart of the wind generator is a surplus DC motor from Fair Radio Sales. Rated at 72 volts, the motor will generate 12 volts when spun at around 100 RPM, so direct-drive is feasible. The rotor hub is actually the center from a replacement automobile fan with the flexible blades removed. The remaining blade stubs are already twisted at a 30 degree angle, which is a reasonable pitch for the torque and speed required. A spar made from 1/2"-square steel tubing is welded onto each of the six blade positions. The hub is

fastened to the motor shaft with an arbor made from a short piece of 3/4" pipe and a pipe flange.

Blades for the rotor are made from corrugated plastic signboard. Two identical 10" by 30" pieces are cut for each blade and are pop-riveted together, with the 1/2"-square steel spar sandwiched down the middle and anchored with sheet metal screws. Duct tape will seal the edges of the blades.

The DC motor is strapped into a cradle made from two pieces of angle iron welded to an upside-down pipe flange. The flange then threads onto a four-foot length of 1-1/4" pipe that serves as a mast. The mast pipe rests on a "lazy Susan" ball bearing inside the tower, allowing it to pivot freely. Rather than build a complex collar and brush mechanism, the wires from the DC motor were simply passed down through the center of the mast pipe. The wind very seldom shifts around a full 360 degrees, and even should this happen it will only cause a single twist in a pair of wires hanging straight down for fifty feet—hardly a cause for concern.

Water-pumping windmills used a folding tail to protect the rotor from excessive wind. A similar method was used here, but instead of pulling on a rope to fold the tail, an old antenna rotor serves the purpose. Mounted on a short section of mast welded to the angle-iron cradle, the rotor controls a tail vane made from the same corrugated plastic signboard as was used for the blades. The plastic is pop-riveted to a boom and crosspiece made from 1/2" electrical conduit. When storms or high winds are expected, the rotor drives the tail vane 90 degrees, moving the blades sideways to the wind and protecting them from damage.

The wind generator must be connected to the batteries through a blocking diode, just like the one used for the solar panels. Without a diode, the motor would simply spin, driving the rotor in reverse until the batteries were drained. If the wind generator produces more than 12 volts, some way to regulate the current is necessary to protect the batteries. This can be as simple as a power resistor (or an automobile headlight) connected in series with the positive lead, or as complex as an electronic voltage and current regulator circuit.

The wind generator is an ongoing experiment, and so far has survived 50 mph winds while facing the wind. It's even withstood gusts over 70 mph with the tail folded. Future experiments will include larger motors geared up to higher speed using chain and sprockets borrowed from a go-cart. For information on the wind generator project, go

Photo B. Two or more large batteries can be connected in parallel for increased capacity.

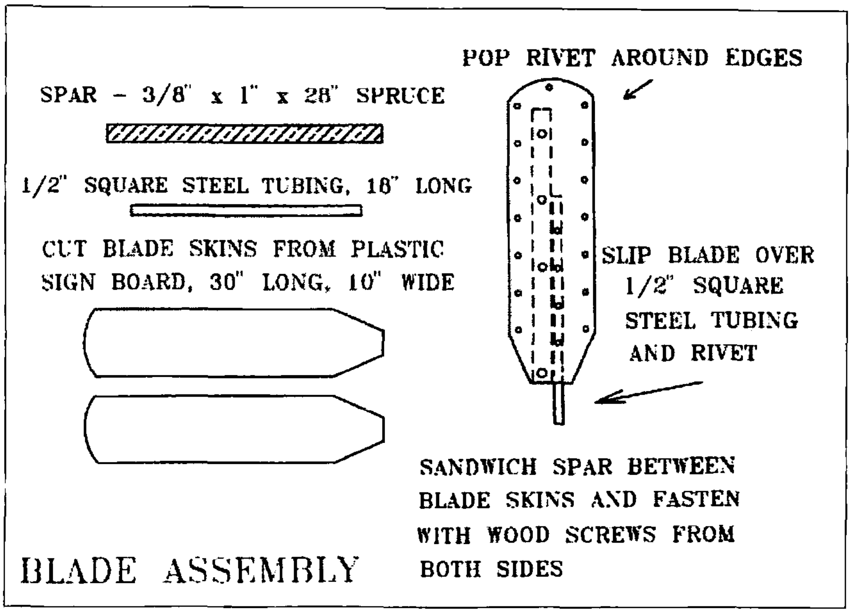


Fig. 4. The wind generator blades are cut from corrugated plastic signboard. Two pieces are pop-riveted together with a spruce spar between them for stiffness.

to my Web site [www.bioelectrifier.com], where I have set up a page for updates as they develop.

120 volt AC power

Okay, you've got a set of batteries, and all your 12 volt DC-powered equipment is functional. What about 120 volt AC power for additional equipment, a few lights, and if it's wintertime, your furnace? It's also nice to be able to power your television in a disaster, since the visual medium can provide maps and other information difficult to obtain elsewhere. Most home appliances operate from 120 volt AC power, so it's a good idea to have some way of providing it when it's needed.

The most common way to generate AC power is to use a gasoline-powered generator. These are available in

Photo C. It's important to keep your solar panels clean!

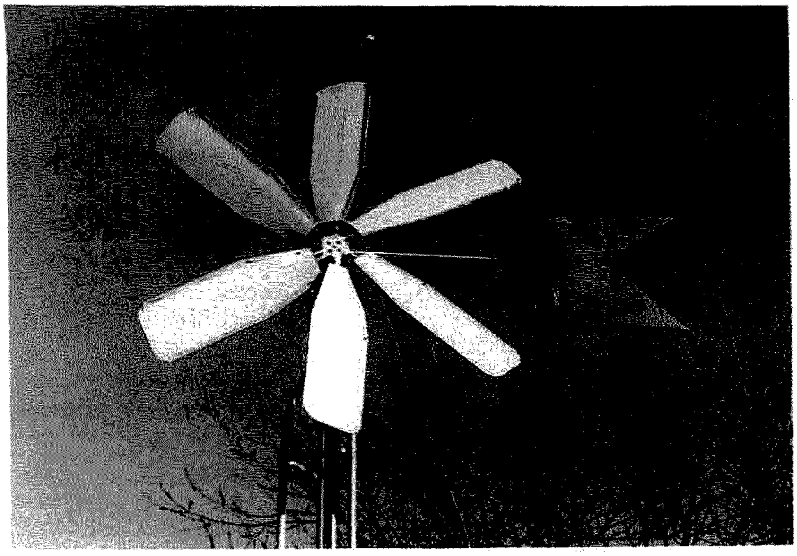


Photo D. The wind generator helps keep the batteries charged when the Sun is nowhere to be found. The tail is folded to prevent damage to the rotor in high winds.

sizes to suit your needs, from a few hundred watts to generators capable of running your entire house. They're simple to operate, and provide a fairly good sine wave. A 5 horsepower gas engine will drive a 2,500 to 3,000 watt generator, which is adequate for most backup needs, and will cost around $275 to $400. The biggest disadvantage, as mentioned earlier, is that it's impossible to store enough gasoline to run a generator for any appreciable length of time.

It's also possible to produce 120 volt AC power from your batteries by using a solid-state inverter. These are available in sizes ranging from small 200 watt units up to very large inverters capable of producing 3,000 watts or more. Unlike engine-powered generators, an inverter is silent in operation, which can be a blessing in the wee hours of the morning.

One advantage of using batteries and an inverter to produce AC power is that they can be set up to come on automatically when the commercial power fails. Many inverters come equipped with a connection for a remote-start contact. This connection can be easily added to others by simply soldering a pair of wires across the power switch. These wires are then connected to a set of normally closed contacts on a small relay with a 120 volt AC coil. The coil is energized from the commercial AC line. When the power fails, the contact closes, powering up the inverter.

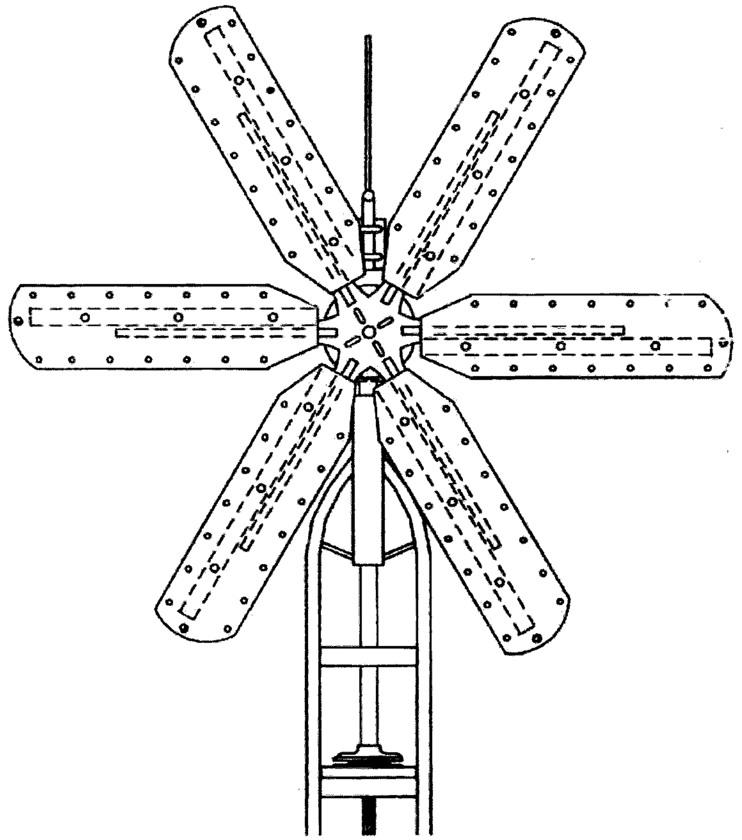


Fig. 5. Front view of the experimental wind generator with blades assembled and installed.

Warning! Warning!

Whether you use a generator or an inverter to produce backup AC power, it's extremely important *not* to connect your emergency power to your household wiring! This can create a situation where your power can backfeed into the commercial power grid, and a lineman working on the circuit can be electrocuted. Although special transfer switches are available to isolate your home wiring from the AC mains, they are very expensive and must be installed by a licensed electrician. In addition, most electric utilities require huge insurance policies, a million dollars or more, if you have a transfer switch installed.

A far safer alternative is to simply run a separate circuit for your emergency power. In our installation,

power from either the inverter or the gasoline-powered generator runs into the basement from the garage through a heavy #10-3 cable. In the basement, this cable feeds a small two-circuit fuse panel, which in turn supplies power to several runs of #14 Romex. Each run of Romex crosses the basement and passes up through the floor to a baseboard outlet. These are located wherever backup power may be needed ... beside the refrigerator, the freezer, the furnace, and in the radio room. A few emergency lights are also connected, and with the batteries fully charged by Sun and wind, and the inverter wired to auto-start, we have backup power and lights any time the power fails.

Even though there has not been a major disaster since we installed our backup system, it has definitely been useful. The auto-start inverter was on line less than a week before we had a power outage that lasted several hours. The commercial power failed three times in January alone, two of these due to intense lightning storms. (Lightning ... in January?) It's great to have a few lights in strategic places that come on when everything else goes dark.

If there is a good side to the recent violent weather and the looming Y2K crisis, it's that more and more people are becoming aware of the need for disaster preparedness. This has always been a big part of amateur radio, so we've got a significant head start on the general population. Still, when equipping your amateur station, don't overlook other areas that may need attention. Be sure that you and your family have an adequate supply of food, water and first-aid supplies, and an alternative method of heating your home in an emergency. When a disaster strikes, hams are expected to be part of the solution. If your own household is unprepared, you will end up being part of the problem.

For more information

In addition to the ongoing wind generator project, there are many sites and articles on the Internet devoted to alternative power. I've linked as many as I could find to my Web site [www.bioelectrifier.com] to help start your search. You can also click on a hot key while you're there and send me a note via E-mail. Of course, you can also reach me by "Uniformed Government Employee" at the address listed at the top of this article, but please include an SASE.

Sources

Northern Tool (formerly Northern Hydraulics) is a good source for gasoline engines, generators, solar arrays, inverters, and even wind generators.

Northern Tool
P.O. Box 1499
Burnsville MN 55337
(800) 533-5545

Harbor Freight Tools is a liquidator for all sorts of useful equipment. You can often find gas-powered generators and engines here at a very low price.

Harbor Freight Tools
3491 Mission Oaks Blvd.
Camarillo CA 93011
(800) 423-2567

J.C. Whitney has probably printed more automotive equipment catalogs than anyone on the planet. They're a good source for alternators and 12 volt DC accessories.

J.C. Whitney
P.O. Box 3000
LaSalle IL 61301
(312) 431-6102

Fair Radio Sales is a familiar name to most hams. Among the goodies to be found here are several types of DC motors suitable for wind generator experiments. They've also got a good selection of large power resistors, rheostats, and meters.

Fair Radio Sales Co.
P.O. Box 1105
Lima OH 45802
(419) 223-2196

Edmund Scientific is a source for high-quality solar panels and quite a few other hard-to-find parts. The lazy Susan bearings used in the wind generator project came from Edmund.

Edmund Scientific Co.
101 East Gloucester Pike
Barrington NJ 08007
(609) 573-6250

The VK Winged Flapper

Only an Aussie would come up with this mobile antenna design ...

Keith Woodward VK2AT
19 Dolphin Ave.
Taree NSW 2430
Australia

Not so long ago, when I swapped my automobile, my spouse firmly put her foot down and said, "You're not going to drill holes in the roof of *this* car." Fortunately, a friend who was a CB operator (and now an amateur) had traveled this path before and come up with a solution.

A rigid and slightly bowed length of aluminum strip was fastened across the roof and clamped in place to the roof gutter with grips and stainless steel screws. The width of the strip was slightly over three inches, and it was approximately one and a half millimeters thick. The curve and bow tension gave a clearance of just under two inches from the roof. This height allows a standard CB antenna base to be fitted with room to spare. Coaxial cable (RG-58CU) was fastened to the strip with ties and then fed back through the rubber surround on the rear door to the interior of the vehicle.

Rubbing my hands with glee, I proceeded to check my VHF and UHF whips for resonance. The smile didn't last long, as my favorite antennas now exhibited high SWR. This was a classic example of an inefficient ground plane. I knew the whips were resonant from previous use, so the conclusion was a simple one. However, what could be done about it was a vexing question.

On two meters, I decided that a resonant ground plane should solve the problem. A length of aluminum strip three quarters of an inch wide was cut to a length of 40 inches. To test the theory, it was given a slight bend one and a half inches on either side of center and clipped as close to the antenna base as possible with a couple of crocodile clips. It appeared as though the car roof had sprouted wings!

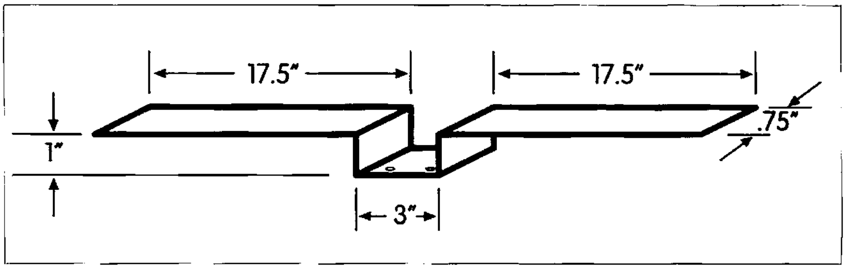


Fig. 1. The shape of the two meter ground plane.

Tests on my two meter antennas now gave a very low SWR similar to results previously achieved with my former hole-in-the-roof mount on the old car. If you refer to **Fig. 1**, you will see a diagram of the final two meter ground plane. The original bends were made at right angles, and then one inch farther along another right angle bend made the wings parallel to the roof support. Two stainless steel screws were used to permanently secure the ground plane.

I later found that when the car was in motion, the wings tended to flap. Thus the ends were secured by two pieces of one-inch-diameter plastic conduit. These had a slot for the ground plane and were secured to the roof mount and ground plane with silicone glue.

Testing my UHF antennas, both amateur and (Australian) CB, still showed high SWR at the resonant frequencies. I decided that two more sets of "wings" was not really the way to

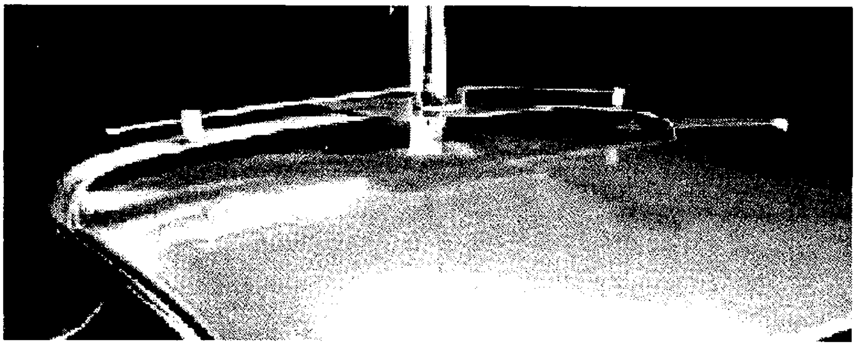


Photo A. Roof mount with both ground planes.

go in solving this problem. After due consideration, I settled on a square aluminum plate. The theory of this is that the side of the square should be smaller than a half wave at the highest frequency used. Also, the diagonal size needed to be longer than a half wave on the lowest operating frequency. This meant that the ground plane would be efficient for any frequency between these two limits.

A square of eleven and three quarter inches would allow a diagonal resonance of approximately 355 MHz and a side resonance of approximately 503 MHz. Thus this ground plane, covering 355 to 503 MHz, would be adequate for both of the frequencies that I wanted to use for mobile operation. This plate was fastened by the CB base to the roof support as well as the two screws for the two meter "wings." You can see this in **Photo A**. Theory worked in practice, and now all my mobile antennas, VHF and UHF, exhibit a low SWR.

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SEND FOR "HOW TO WRITE FOR *73*"

Regens for the Millennium

Part 2: Winding coils.

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Last time, we presented a feature on the typical regenerative shortwave receiver. *(Be sure to see Update in this issue. — ed.)* In it, some rudimentary instructions were given for winding a basic shortwave coil. Readers who have an interest in such a project will be delighted to learn that spending just a few minutes with a calculator will allow them to narrow the coil ranges to any desired portion of the radio spectrum. By combining two fairly simple formulas into a set of program steps, it is possible to accurately predict, usually to within 100 kHz, the properties of a home-brew single-layer coil. Recall that the coil requires a tune winding and a smaller tickler winding.

First we take a look at the formulas. This first equation is used to calculate the inductance value (the number of microhenries) of the tune coil winding:

$$L = \frac{r^2N^2}{9r + 10L_2}$$

Explanation of the formula is as follows:

L is the inductance in microhenries
r is the radius, or 1/2 the diameter of the coil
N is the number of turns of wire in the tune winding
L_2 is the length of the tune winding, bottom to top

Note that both r and N are squared in the numerator, while r and L_2 are each multiplied in the denominator.

Technical hint: When using a formula such as the one above, *always* calculate the denominator *first*. The results can be placed in your calculator's memory. Then, when you calculate the numerator, simply divide by Recall Memory and the formula will be presented neatly while saving a few keystrokes.

Let's assume that we have a commercial shortwave coil that covers 2.9 to 7.3 MHz, and we want to evaluate this coil using the formula. The coil measures one and one-quarter inches in diameter, so we divide by 2 to get the radius. 1.25 divided by 2 yields a 0.625-inch value for the radius. This value needs to be altered only if other sizes of coil forms (pill bottles, cardboard, plastic, etc.) are used.

The commercial coil consists of 23 turns of wire occupying three-fourths of an inch in length on the coil form. Again, we ignore the 4-turn tickler for now, so in the denominator we calculate 9 times the radius (9 times 0.625) and 10 times the length (10 times 0.75). When we get those numbers, we *add* them together and that becomes the denominator, which is stored into your pocket calculator's memory. Thus 9 x 0.625 = 5.625 ... 10 x 0.75 = 7.5 ... and 5.625 + 7.5 = 13.125 ... This is the denominator, and its value is stored in memory.

Now we tackle the numerator. Simply square the radius, r, then the number of turns, N, and *multiply* those values. Thus 0.625 x 0.625 = 0.390625 ... 23 x 23 = 529 ... and 0.390625 x 529 = 206.64. Note that the type of calculator you use may alter some of the decimal points and give slightly different decimal results.

What remains is to divide this numerator (206.64) by the value of the denominator still in memory (13.125), which yields 15.74 microhenries, completing the first of our two formulas. Again, note that we *add* items in the denominator but *multiply* items in the numerator. The resulting value of 15.74 microhenries gives us the characteristic inductance of the coil tune winding.

To calculate the frequencies this particular coil might cover, we use a

second formula that depends on the results of the first formula to continue. This second formula is worked in a similar set of steps:

$$F_{kHz} = \frac{1,000,000}{2\pi\sqrt{LC}}$$

In this formula, L is the value of 15.74 microhenries carried over from the first formula. 6.28 is derived from two times the value of π (3.14159) and can be limited to 2 decimal points, or 6.28. The numerator can be one of two values, 1,000 for MHz or 1,000,000 for kHz, depending on which part of the spectrum you are tuning for. Use 1,000,000 for longwave and BCB coils, and 1,000 for shortwave coils.

Notice that we have left a couple of items of unfinished business in the denominator. First, we need to find the value of C. This is actually a pair of values, and we'll need to run the entire formula twice, once for the low end of the tuning dial, and again for the high end. This will yield the entire tuning range for the coil. The value of C is measured in picofarads and is typically a maximum of 365 pF for the low end of most broadcast types of capacitor. The high end is typically 50–100 pF, so we'll estimate 50 pF for the high end in this formula. Finally, when L and C are known, we first multiply them, then take the square root of that value, and multiply by 2π (6.28). That result is the denominator, which is stored into memory.

For example, let's use L = 15.74 microhenries and C = 50 to 365 picofarads. We'll do the low end first: 15.74 x 365 = 5745.1, the square root

Continued on page 24

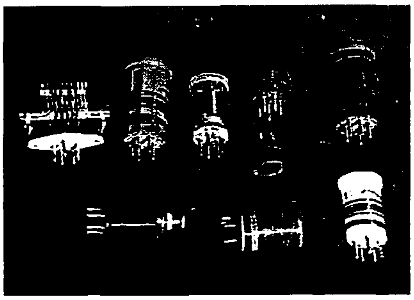

Photo A. Home-brew coils for a regenerative receiver. Note toroidal version, center right.

Wire Gauge	Wire Diameter in Inches
14	0.065
16	0.052
18	0.041
20	0.033
22	0.026
24	0.021
26	0.016
28	0.013
30	0.010

***Table 1.** Wire specifications.*

of which is 75.7964. 75.7964 x 2π (6.28) = 476.00, which is stored in memory.

Now simply enter 1.000 and divide by recall memory, and you'll get 2.1 MHz as a result. Note that the original coil tunes from 2.9 MHz, so the capacitor in the commercial receiver must be something other than 365 picofarads. 300 picofarads works well here.

Calculation for the high end of the coil is done in exactly the same manner. We just use the formula a second time: 15.74 x 50 pF = 787, the square root of which is 28.0535. So, 28.0535 x 2π (6.28) = 176.176, again stored in memory.

Dividing this number into 1.000 gives a value of 5.67 MHz, which is too low, suggesting the real value of the tuning capacitor is closer to about 30 picofarads. Using that value in the formula once more yields a high end of 7.33 MHz, which is very close to the 7.3 MHz value printed on the coil.

It might be useful to mention here that even if the values of the tuning capacitor are known precisely, other capacitances in the circuit stemming from wires, the bandspread control, and the antenna tuning capacitor will introduce small amounts of error. Even with these errors, the formulas can be adjusted to limit the results to within 100 kHz of actual performance. Thus, the reader could wind this same coil and arrive at, say, 2.8 to 7.2 MHz (or even 7.4 MHz). By adding or deleting a winding or two, a home-brew coil could be constructed to certain specifications; examples would be to add WWV at both 5 and 10 MHz or to include two amateur bands in the same coil (40 and 80 meters, perhaps).

If a signal generator and frequency counter are available, actual performance of a home-brew coil can be assessed, and the values of C can be more narrowly defined.

When evaluating several coils, you may have to settle on a pair of average values for C that agree with all coil sets. If this method is used, set the bandspread capacitor to the center of its range and leave it there. Use the bandspread to tweak out the last few kHz on either end of the tuning coil, but don't include those values when you mark the coil range on the form. Know also that one home-brew regen

FORMULA 3

This formula is an inverse of the first formula presented. It allows for calculation of the number of turns on the coil if the inductance L is already known.

$$N = \sqrt{\frac{L(9r + 10L_2)}{r^2}}$$

Since the first formula is explained in such detail in the text, this one is presented for reference only. Use the L value of 15.74 in this formula for an example.

Special note: L_2 is usually shown as a lower case L in most formula books, but was presented here as L_2 for clarity and ease of manipulation, especially if computer methods are employed.

Cosmetic Cell Entries	
B3 Coil diameter in inches	B18 Low end
B5 Number of turns	B20 High end
B7 Length of turns	F3 Radius r
B10 Tuning capacitor	F5 Radius r squared
B12 Low end	F7 9 * r
B14 High end	F10 Coil, microhenries
B16 Band tune	
Calculation Cell Entries	
D3 Entered by user (in.)	D20 (1000/g20)
D5 Entered by user	Note that D18 and D20 can use 1,000,000 for kHz coils
D7 Entered by user (in.)	G3 +d3/2
D12 Entered by user (365 pF)	G5 +g3 * g3
D14 Entered by user (50 pF)	G7 +g3 * 9
D18 1000/g18	G10 [+g5 * (+d5 * d5)]/[+g7 + (d7 * 10)]
Scratchpad Math Cell Entries (no labels, done for clarity)	
G12 +g10 * d12	H14 @SQRT(g14)
G14 +g10 * d14	H16 +g16 * 2 [2 pi]
G16 22/7 [pi]	I13 +g5 * (d5 * d5)
G18 +h12 * h16	I15 +g7 * (d7 * 10)
G20 +h14 * h16	I17 +i13/i15
H12 @SQRT(g12)	

***Table 2.** Spreadsheet cell entries for the first two equations.*

receiver may vary slightly in range for a given coil form, when compared with another model of the same unit.

One last suggestion for the pair of formulas. It is easy to incorporate them into either a computer spreadsheet such as Lotus 1-2-3 or into a BASIC program, either of which can be run and rerun as more coil windings are tried and perfected. Not only can the values of L and C be manipulated, but some significant "What if?" testing can be done before the coils are ever constructed.

For example, coils of different diameters may be assessed, as well as what adding or removing turns would mean. Remember, though, that you will be altering the entire complement of values — in other words, more turns of the same length of wire on a smaller-diameter form will add length to the coil winding, and so on. Make sure to take this into account as you explore the new possibilities on your computer screen.

Table 1 shows wire sizes. In counting the number of turns on a coil of a given length (here the diameter/radius values are ignored), simply use the wire size closest to the decimal value found by dividing the coil length by the number of turns. In our example of the original commercial coil, we find 23 turns of wire stretched over 3/4 of an inch, giving us a wire diameter of 0.032 inch (0.75 divided by 23), or a wire gauge of 20. Since home-brew methods will be less than precise, use the gauge that corresponds to the closest wire size on the table. For example, if your calculations call for 75 turns of wire on a form measuring 0.825 inch in length, the wire size will be 0.011 (.825 divided by 75) which comes close to 30 gauge wire on the table. A third formula is given at the end of the article which may prove helpful here. Note also that none of the formulas presented here requires wire sizes, which is the beauty of this whole process.

Table 2 shows a sample of a spreadsheet that will display the method I use to evaluate home-brew coils.

The regenerative receiver makes a good first project, as well as a test bed for more experimentation, and the results can easily be transferred to other projects such as other receivers, a QRP transmitter, or a tester for determining variable capacitor values.

The spreadsheet (or BASIC) calculations can be very useful in setting up coil forms to cover a specific range, or for evaluating the theoretical limits of a receiver's reception. As an example, by using the above formulas or spreadsheets, you can determine that exactly 100 turns of #30 on a diameter of either 1 or 1.25 inch(es) will cover the broadcast band from 0.5 to 1.5 MHz (plus or minus a few kHz). Thirty-gauge wire can be difficult to work with, but 100 turns is attainable fairly easily.

For longwave coverage, some 200 to 300 turns of 30-gauge wire are needed. Checking the formulas once again, we see that the theoretical limit bottoms out at about 200 kHz for a 365 picofarad capacitor. Much below 200 kHz, a much greater effort is required to wind a coil using 30-gauge or thinner wire. Although 190 kHz may be attainable, 150 kHz would be nearly impossible. Somewhere slightly below 200 kHz, the coil design reaches its theoretical limit of coverage and cannot go any lower without a complete re-design of the receiver. We simply run out of room on the coil form to add any

more turns. The same limitation is true at the high end, but for a slightly different reason. At approximately 12 to 15 MHz, the ability of the coil to detect weak (or even moderately strong) signals drops off rapidly. While the formula still holds true, the real physics inside the detector tubes start to fail. Thus a VHF version of the receiver would require a special VHF tube, such as a 6AK5. This means that coverage of the 30–50 MHz public service band or the 118–136 MHz aircraft band is theoretically out of range of the normal shortwave receiver. By the time all of these conditions are compensated for, you no longer have a regen of the original design.

Tickler time

Now we turn our attention to the tickler winding necessary on each of the coil forms. A good starting rule of thumb is 4 turns of tickler winding for every 10 turns of tune winding. If the ratio of tickler to tune windings is correct, the unit will receive signals across most of the band, with the regeneration control advanced only about a quarter of a turn from minimum. In other words, if the regeneration knob is set for minimum at the seven o'clock position, almost all stations should be received with a setting of between eight o'clock and eleven o'clock maximum. Only rarely should the control be advanced beyond this point.

If the regeneration control must be fully advanced, there are too few turns of tickler winding and more wire will have to be added, usually starting out with a longer piece of wire. On the other hand, if the regeneration control is too touchy at the minimum end, the tickler winding is too long, and needs to be shortened. Generally the tickler winding is made of the same gauge wire as the tune winding, but this is not critical. Experimentation here with various wire sizes may prove interesting.

Additionally, it is possible to construct multiband coils for the regen receiver, using a variety of techniques:

(1) Use a miniature toggle switch to short out the top 3 or 4 windings of the shortwave coil. This will have the effect of raising the coil tuning frequency. The switch can be mounted at the top of the coil form, yielding a 2-band coil.

(2) Use a miniature toggle switch to jumper additional sections of the tuning capacitor into the circuit. This has the effect of lowering the tuning range. This switch is soldered onto the tuning capacitor if it has more than one tuning section.

(3) Wind a coil consisting of several gauges of wire on one form, with a tap at each junction. Remember the adage that all radio builders use, "Many turns fine wire, few turns heavy wire." (This adage is used universally in winding solenoids, relays, step-down transformers, etc.) Start at one end with about 80 turns of 30-gauge wire, then switch to about 30 or 40 turns of 24-gauge, then about 12 to 15 turns of 20-gauge, and so on. This multi-gauge winding will negate the formulas previously given, but with a multiple-position rotary switch you will be able to add bandswitching to your home-brew receiver. This switch may be mounted on the coil form itself (I used a pill bottle to house both the coil and the 4-position switch; they can also be mounted at a convenient place on the front panel of the receiver). With a little experimentation, you can adjust the multiple windings (or simply the next plug-in coil form) to pick up coverage where the last one leaves off.

I should mention that most capacitors are very nonlinear in their coverage of any given band. If we take the commercial coil as our example, we will find that as we tune up the band from minimum to maximum we see coverage that looks something like this:

2.9 . . . . 3.0 . . . . 3.4 . . . . 4 . . . 5 . . 6 . 7 MHz.

Be sure to design your home-brew coils with the most desired portion of coverage at the lower end of the band. About the only realistic exception here would be to put a very strong station such as WWV (at 5.0 or 10.0 MHz) near the top of the tuning range, and separate all the other reception down at the lower end of the tuning range. The formulas will prove helpful here.

Finally, if 4- or 5-pin coil forms and sockets cannot be located, 8-pin octals may be substituted. This leaves plenty of pins for a multiband coil. Also, the 8-pin plug can be easily attached to common pill bottles, providing a wealth of coil forms to use for experimentation.

You, Too, Can Be an SOB

Hams should be heard but not seen—put your left hand on the Callbook *and repeat after me ...*

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As president and organizer of a new fraternity aimed at recapturing the traditional policies of hamming, I invite those few remaining radio amateurs who shun personal contact with other hams to join an international net known as the "Solitary Operators' Brotherhood."

We are not to be confused, however, with chronic QRMers sometimes referred to by our initials. When you hear an irate operator saying, "Sorry, Charlie, I missed your QTH on account of them SOBs was tunin' up on you again," the chances are he is not referring to one of us.

We legitimate SOBs, whether or not we use dummy loads, have banded together to preserve and perhaps rebuild what has become a dying subculture among amateurs. We offer an alternative to hamfests and club meetings and picnics and eyeball get-togethers of all kinds, because we share one fierce conviction: We believe in communicating with our fellow hams, but not in mingling with the buggers.

Hamming is for chatting from a distance, we think. It is for exchanging thoughts, ideas, information—even for sharing emotions—with strangers out there in Radio Land whom we cannot see and by whom we cannot be seen.

Because they are invisible to us, we perceive those we contact as perfect creatures, handsome, wholesome, witty, wise, paragons of beauty, knowledge, and virtue. And because we are invisible to them, we can assume their perceptions of us are equally inaccurate.

This pleasant state of affairs exists, of course, only for as long as we avoid physical contact with each other. It instantly evaporates if and when we visit each other's shacks or eyeball each other at club meetings, hamfests, banquets, flea markets, or any of the myriad of similar illusion-destroying social events at which non-SOBs congregate. For who can deny that to meet a fellow ham—any fellow ham, every fellow ham, however delightful his/her voice, whatever the perfection of his/her on-the-air manners—is to be disillusioned, to discover that he/she is, like the rest of us, a scruffy mortal with a runny nose, rumpled clothes, and scratches on his/her gear.

Despite this obvious truth, the tendency among most radio amateurs today is to socialize, to congregate, to mingle. And that is fine for those who so enjoy the emotional reinforcement of flocking together with birds of like feather—they don't mind the disillusionment it inevitably brings.

But the Solitary Operators' Brotherhood was organized for those of us who think it more appropriate to emulate the pioneers of our hobby. Those giants of spark and coherer or catwhisker days sat alone in attic and basement, history tells us, tinkering up QSOs with other weirdos in other garrets and other cellars, blocks and even miles away. That was the golden age, as we SOBs see it, the era of hermit hams, of non-gregarious gadgeteers, of antisocial pseudo-scientists who loved their Leyden jars and revered their varicouplers, but hated interruptions and despised company.

Today, we of the Solitary Operators' Brotherhood have readopted that ethic. We contend that, while other hams have interests akin to ours, all hams are strange by definition, some even stranger than we. We feel very strongly, therefore, that hams should never congregate

Continued on page 41

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The Ten-Tec 1254

Fifteen programmable memories enhance this microprocessor-controlled receiver.

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There it was. "Hello, Americans. This is Paul Harvey. Stand by for news!" Those where the first words I heard coming out of the headphones on my brand new Remco crystal set. In fact, the only station I could hear was the local AM station, WHBC, and the last thing I wanted to hear was some new guy named Paul Harvey. I recalled my first experience with radio with a smile as I was unpacking the newest kit from Ten-Tec. It's their model 1254 communications receiver.

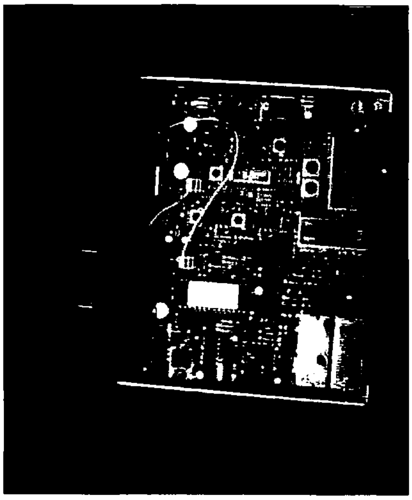

Photo A. Inside the Ten-Tec receiver. Notice the clean layout of the PC board. All major components mount on this one PC board. There is a smaller PC board that holds the display components.

The Ten-Tec 1254 covers 100 kHz to 30 MHz. Depending on the mode of operation, you can move from one end of the band to the other in either 2.5 kHz steps in SSB or 5.0 kHz steps in AM mode. If you're in a real hurry, a push of the fast button increases tuning steps to 100 kHz. A "Clarifier" control provides ±1.5 kHz fine tuning for CW and SSB modes. The clarifier also works in AM mode, too. You know where you're at with the bright green six-digit LED display, and several LEDs provide feedback for the mode and tuning speed.

This receiver is a dual-conversion design. The first IF is 45 MHz and the second is 455 kHz. Selectivity is specified as 4 kHz @ -6 dB. Sensitivity is 2.5 µV for 10 dB SNR at 30% modulation in AM mode, while the SSB mode specs out at 0.5 µV for 10 dB SNR.

Signal flow

The RF input from the RCA antenna jack is routed to an input bandpass filter to improve image response. From the filter, the signal is dropped into the first mixer being fed by the first local oscillator. The first local oscillator is controlled by the microprocessor. The microprocessor is an 8-bit custom-programmed PIC 16C57. This processor also controls the display board and the LEDs.

After the first mixer, the crystal filter removes the unwanted signal and the desired signal is amplified before being sent on to the second IF at 455 kHz. The second local oscillator operates at 45 MHz and is adjustable via the clarifier control. Our signal, once again amplified, is sent to a 455 kHz ceramic filter, two IF amplifiers, and then to either the AM detector or the product detector. An AGC line controls a front end attenuator to keep the audio output constant as signals fade in and out. The audio amplifier will produce up to 1.5 watts of power. Audio is available from the top-mounted speaker or from the headphone jack. This is all done with 10 ICs, 26 transistors, and 16 diodes. All of these devices require 250 mA with no signal. A 15 VDC at 800 mA wall transformer supply is included to power the Ten-Tec 1254; an internal 9-volt battery holds the memory locations when you power down.

Building the Ten-Tec 1254

As with all the Ten-Tec kits, the 1254 is assembled in phases, or as I like to think of them, as sections. The 1254 assembly takes about seven phases from opening the box to tightening the last screw. Ten-Tec reports that the average assembly time will be about 25 hours. In my case, and I've

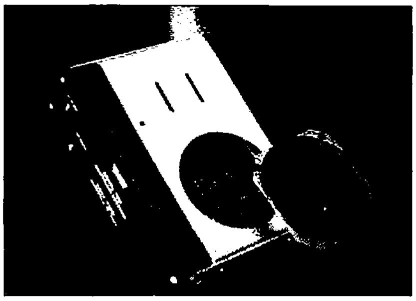

Photo B. No *holes punched in chassis to mount the speaker to. Ten-Tec wants you to glue the speaker in ... hmmm ...*

melted a lot of solder in my day, it took me two evenings, or about eight hours.

As with every kit I've ever assembled, the toughest part for me is cleaning up the workbench! Since my wife works on Saturday night, I armed myself with a case of cold Diet Coke®, a ten pound bag of Oreo® cookies, solder, and oldies on the radio. With four cats watching the entire assembly process, I was all set for a night of kit building!

The manual is clear and easy to understand. The manuals from Ten-Tec seem to get better with each new kit they produce. It's spiral-bound so that it lies flat on the workbench, and contains numerous full-size drawings and schematics.

There are a lot of parts inside the 1254. There are two PC boards, one for the display and the other for the receiver. Both PC boards are double-sided with plated-through holes. Ten-Tec mentions several times in the assembly instructions that a misplaced part will be difficult to remove from the PC board. The PC boards have all the part legends clearly silk screened on them.

Photo C. The assembled rig is small enough to travel with. Comes with its own wall power supply.

Assembly begins with the display board. Here, the parts for this phase are enclosed by themselves. You don't have to wade through all the parts in the kit to find just the ones for this PC board. This is a nice touch from Ten-Tec and I wish they would extend this thinking down to the phase level, packing all the different phases into separate bags. Yes, I know that would increase the amount of labor needed to kit up the 1254, but perhaps it might be worthwhile from the builder's standpoint.

Basically, the display board contains the display (duh!) and the various switches to control the microprocessor. The parts are very small—1/8 watt resistors are used, and attention to detail is required to stuff this PC board. After the display board is completed, work begins on the main PC board.

The main PC board contains both the RF and the microprocessor sections. In fact, the microprocessor and PLL sections are the next phase of assembly.

The microprocessor is the only part of the 1254 that uses an IC socket. You do not want to install sockets for any of the other ICs. In RF design, adding a socket might muck up the works. With the microprocessor and PLL sections completed, this entire section, along with the display board, may now be tested. This is one aspect of building a Ten-Tec kit. You know from the start if the kit will work because you complete and test each phase as you go. When I powered up the 1254 for the test, everything kicked right in. Although you can't do anything with the display, it was a lot of fun trying out the memories.

Each phase is assembled and tested the same way. You stuff each phase and then conduct the required tests to verify operation. If you follow the instructions, you're guaranteed a working kit when you're done. On the other hand, if you have completed a phase, and the tests prove there is something wrong, you need to fix the section before continuing on. There's little sense to continue to stuff the next section, if you can't get the last one to work.

Continued on page 30

The Ten-Tec 1254

continued from page 29

Some novel tests during construction

I'm not sure the ARRL would let me use their lab for a weekend to help with the assembly of the Ten-Tec 1254. So, the engineers at Ten-Tec had to come up with a way of generating the necessary test signals to verify the operation of the different sections. In one particular section, you're asked to dangle a clip lead across the display board. The idea is to have the receiver listen to the multiplex signals generated by the microprocessor. That's a slick idea!

The engineers at Ten-Tec designed into the 1254 a built-in 45 MHz test signal. In real life the frequency synthesizer can't tune below 100 kHz. But by pushing a combination of buttons, it will. In the process, the frequency synthesizer is programmed to generate a 45.0000 MHz signal! While not a Cushman station monitor, it works just fine.

Parts are parts

All the components used throughout the Ten-Tec 1254 are prime. No surplus parts are used. The parts are well marked. Also, during assembly if you select a part that won't fit the board, it's the wrong part. This saved my butt once during construction. In my case, I was going to stuff a ceramic cap in the wrong location, but the part did not fit the holes.

The molded inductors, on the other hand, were hard to identify. This is not the fault of Ten-Tec, but of a combination of small parts and paint colors all having the same shade as mud.

There are also several small diodes that were a kicker to identify. Ten-Tec may save their repair department some grief by packaging these diodes by themselves.

Tuneup

The tuneup is rather simple. You follow the instructions and use the built-in test signals to tweak the receiver. I did not find any of the tuned sections to be very tight.

I did find that you will need the proper tuning sticks to fit the transformers. I would suggest to Ten-Tec that they should supply the required diddle sticks. It's just too easy to try to adjust these coils with a butter knife—and thereby ruin them.

There's only one adjustment to make to bring the receiver on frequency. That's easy enough to do. Dial up WWV and adjust the master oscillator until the frequency readout is correct. Not high tech, but good enough for government work.

Nits to pick

All in all, I was very happy with the way Ten-Tec designed their kit. There are a few points that I think they should have addressed.

The one that really grinds my cookies is the fact you have to glue the speaker to the case! This is beyond any mainstream thinking—especially since Ten-Tec is known worldwide as a manufacturer of electronics enclosures. Come on, guys, punch me a few holes and throw in a screw or two to mount that speaker!

And don't put down that glue bottle yet! There are a few other places you need to add a drop of glue to hold the rig together, too. That's tacky!

On the air

The 1254 is about as simple to operate as you can make a receiver. You get the usual on/off and station selector. There's an AGC circuit that works quite nicely, and of course you know where you're at with those big LEDs used in the display.

You move around the bands by selecting the fast button. This kicks in warp speed at 100 kHz steps. The Memory Write button does just that: It writes the memory location to the microprocessor. The VFO/Memory button toggles between the VFO and the memories. All in all, you can master all the controls of the 1254 in about 10 seconds! It's not a hard radio to work.

So, you may be wondering, how does it work? It's just great! You can receive SSB signals that sound good and the 1254 seems stable enough to decode digital signals, too. There's plenty of audio and the AGC works just fine. Yes, the 1254 does have some birdies, but none seem to be objectionable.

The 1254 is a great rig with which to introduce electronic kit building and hamming to a would-be Novice. Yes, with some hand-holding, a person who has never assembled a kit should be able to build the 1254.

Building a receiver that picks signals out of the air is a moment you'll never forget. After I had the 1254 running, and not even put in its case, I *had* to dial up 1480, WHBC: "... Hello, Americans. This is Paul Harvey. Stand by for news!" *Some* things never change.

The Amazing Wiebelfeltzer

This CW filter is semi-analog, quasi-digital, and weirdo-nomic.

Gerald F. Gronson K8MKB
3529 Belinda Drive
Sterling Heights MI 48310

This device is for CW operators. Think back to the days when you were learning to copy CW. Someone was in the same room with a code practice oscillator, sending a clear, easy-to-copy signal.

Remember? Those were the days! No QRM, no QRN, or QSB. Just a clear signal.

Well, sir, now you can have that experience once again (minus the agony of learning) when you get on the air. "How?" you say? The answer is easy. The "Amazing Wiebelfeltzer" device eliminates QRM, QRN, and the like, and makes it sound like the guy you're working is in the same room with you using a code oscillator. (Oh, by the way: It's pronounced "VEE-buhl-FELT-sir," and it's a semi-analog, quasi-digital CW signal processing device. Heck, what else should I call it?)

Photo A. *Front view.*

The unit consists of three main sections: the phase-lock loop; the sidetone oscillator; and the adjustable noise blanker (*400 Ideas for Design*, page 261; adaptation of an article by Edward I. Levy). It runs on 13.8 volts, is easy to build, and works really neat.

The signal enters pin 3 of the PLL, and is changed from a tone into a series of DC pulses. The pulses are inverted by the 2N3904, which keys the sidetone oscillator. The adjustable noise blanker responds to both signal or noise. Sometimes a noise pulse can appear to the PLL as a valid signal and get processed and output as a DC pulse. It would be of shorter duration than a valid signal and trigger the sidetone oscillator. This, of course, would get to be quite an annoyance. This is where the noise blanker comes in. Because for the most part a noise pulse is of much shorter duration than a valid signal, the noise blanker holds the 2N3904 off for a length of time selected by the user. If a noise pulse arrives in between words, or letters, or even between a dit and dah, it doesn't get through. All you hear is the signal you are copying!

The unit can be built on perfboard. Parts placement and layout are not critical, and parts are easy to obtain. It would be wise to house the completed circuit board in a box that is one-and-one-half to two times as large as the box I used—then a power supply could be built in and it would give a greater front panel area. This latter is necessary because most of the controls need to be accessed during normal operation. (I tried to limit the front panel controls to four, but that wasn't practical.) The main frequency-adjust potentiometer is a 10-turn type, which makes a turns counter necessary. R6 in the noise blanker is a 10-turn trimmer, necessary to adjust for variances in 4011s. It may be adjusted to zero ohms in some cases, or set as high as 800 for others.

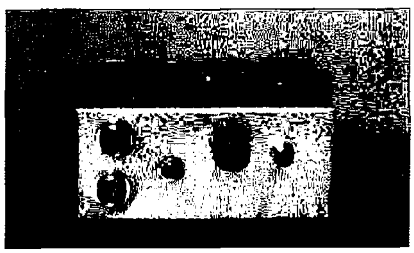

Photo B. *Rear view.*

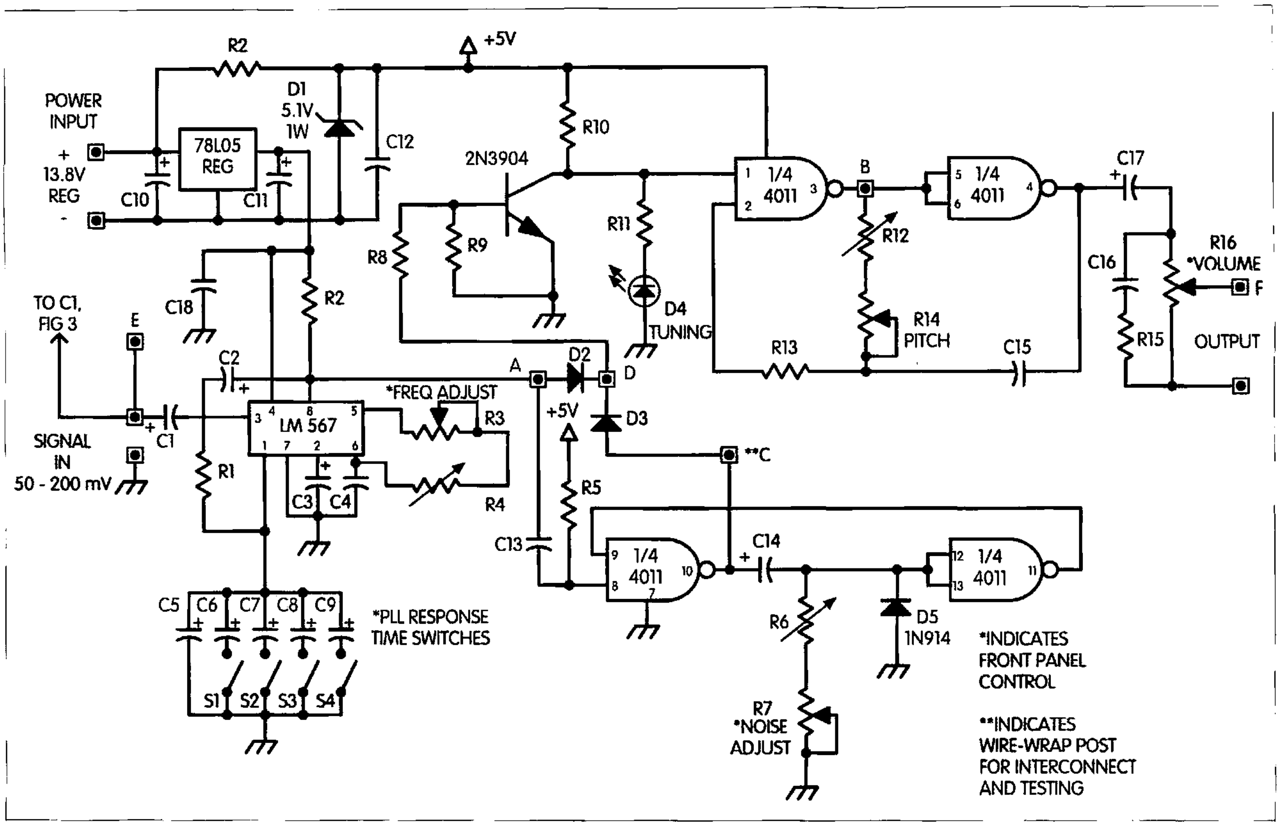

***Fig. 1.** The Wiebelfeltzer. +5 V connects to pin 14 of the 4011.*

A word about the capacitors that are connected to pin 1 of the 567 PLL: Their value at pin 1 controls the response time of the PLL, with a smaller, 0.5 µF cap allowing a faster response than, say, a 4.5 µF one of larger value. This is important because the different combinations of noise and CW speed will be processed quite differently. The *noise blanker* time delay also comes into play as well. With a little use, the operator will become aware of essentially four "ranges" of CW speeds, and where to set the PLL response time and noise blanker settings for best operation.

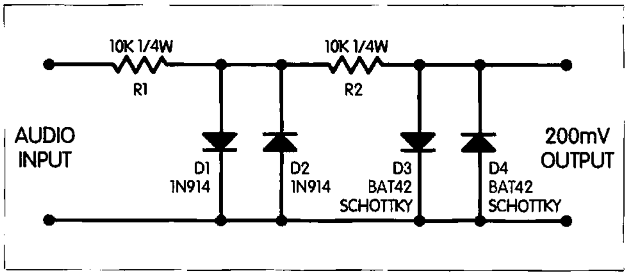

***Fig. 2.** Optional signal processor. D3 and D4 are Schottky-type BAT-42 or similar. Unlabeled resistors are R18 and R19.*

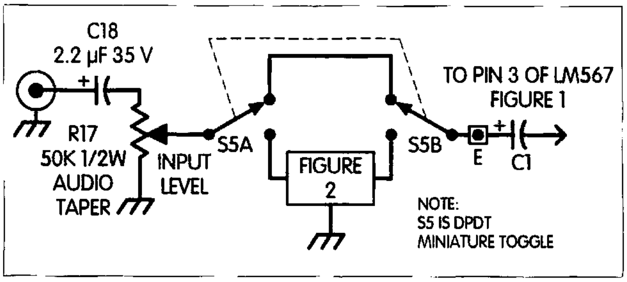

***Fig. 3.** Unlabeled cap is C19.*

The Wiebel I built is in a box that measures 5 x 4.5 x 2.5 inches. As I have mentioned, that has proven to be somewhat small, in that it makes for a crowded front panel. I recommend a cabinet up to twice as large. The Wiebel, in some ways, is like a secondary receiver, which will become obvious with use.

It is recommended by the manufacturer of the 567 PLL that the input to pin 3 be in the range of 50 millivolts to 200 millivolts. That would require a receiver with an AGC. In the case of no AGC available, or not enough AGC, use the input conditioning circuit (**Fig. 2**), which should be wired so it can be switched in or out as needed.

A set of stereo earphones should be wired so as to allow raw signal or processed signal in one or both ears.

All parts are of the standard non-critical variety. A glass epoxy printed circuit board should be used for permanent construction. I used perfboard, which allows some experimentation but is more tedious to work with. [If there is enough response, I may make available a kit of parts (minus enclosure).]

All in all, the Wiebelfeltzer does a pretty good job of eliminating the

Parts List			
C1, C2, C9	2.2 µF 15 V tantalum	R7	10 k lin. single-turn 1/2 W panel-mnt pot
C3	0.22 µF 15 V tantalum	R8, R18, R19	10 k 1/4 W carbon
C4	0.1 µF 15 V tantalum	R9	220 k 1/4 W carbon
C5, C6	0.5 µF 15 V tantalum	R10	150 ohms 1/2 W carbon
C7, C8	1 µF 15 V tantalum	R11	560 ohms 1/2 W carbon
C10, C11	1 µF 25 V electrolytic	R12	15 k 25-turn 1/2 W top-adjust trimpot
C12	33 µF 6.3 V electrolytic	R14	10 k lin. 1/2 W panel-mnt pot
C13	0.22 µF 35 V tantalum	R16	10 k audio taper 1/2 W panel-mnt pot
C14	10 µF 35 V tantalum	R17	50 k audio taper 1/2 W panel-mnt pot
C15	0.047 µF 35 V tantalum	D1	5.1 V 1 W zener
C16	1 µF 35 V tantalum		78L05 +5 V regulator IC
C17	2.2 µF 35 V tantalum		LM567 phase locked loop
C18	0.047 µF 50 V tantalum		4011 CMOS quad 2-input NAND gate
C19	2.2 µF 35 V electrolytic		2N3904 silicon transistor
R1, R13	330 k 1/4 W carbon		LED, red, panel-mnt
R2	1 k 1/4 W carbon		5 x 1N914 silicon diode
R3	2 k lin. 10-turn 1/2 W panel-mnt pot		2 x BAT-42 or similar Schottky diode
R4	20 k 25-turn top-adjust trimpot		4 x SPST switch
R5, R15	360 ohms 1/4 W carbon		1 x DPDT min. toggle
R6	1 k lin. 10-turn 1/2 W top-adjust trimpot		1 pkg wire-wrap posts

Table 1. Parts list.

tedium of operating in a noisy, signal-congested situation. This will make for less operator fatigue in most cases.

And why *not* call it a Wiebelfeltzer??

Further reading

Flynn, George. *MOS Digital ICs*, Howard W. Sams, first edition 1975.

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Pascoe, Robert. *Solid State Switching*, John Wiley & Sons, 1973.

Peatman, John B. *Design of Digital Systems*, McGraw-Hill, 1972.

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If you're a No-Code Tech, and you're having fun operating, tell us about it! Other No-Code Techs will enjoy reading about your adventures in ham radio—and we'll pay you for your articles. Yes, lots of nice clear photos, please. Call Joyce Sawtelle at 800-274-7373 to get a copy of "How to Write for *73* Magazine."

Number 34 on your Feedback card

It's Senior Spider vs. Y2K!

Build this QRP rig now —just in case.

Mike Agsten WA8TXT
401 W. Bogart Road
Sandusky OH 44870

I doubt if I need to tell you why you need a simple, reliable, low-power CW transceiver that can run off a solar-charged 12 volt battery, but if I must, I'll say it in just three words: why two kay! We can't be certain what will happen when the new year rolls around, but in any significant regional or national disaster, it is quite possible that ham radio (yes, you!) will be the last best hope for telecommunications when that house of cards crumbles.

In a short-term disaster, most hams who can will get on the air with big transceivers powered by gasoline-fueled generators. But what about medium- and long-term problems when gasoline is scarce? In that situation, band QRM will slowly die out as petrochemical fuel sources dry up, leaving only those stations equipped with wind, solar, or hand-crank power for battery recharging. And few of them will be running 100 watts or more! Most will be running less than 10.

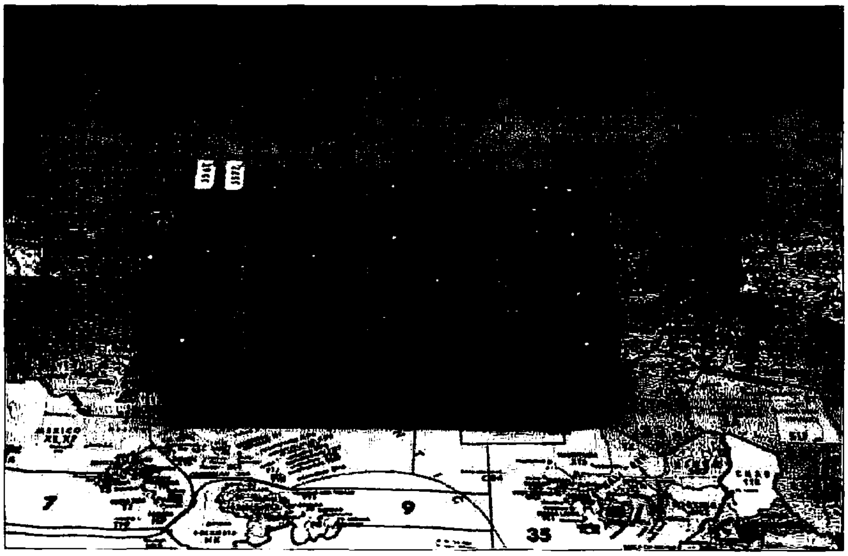
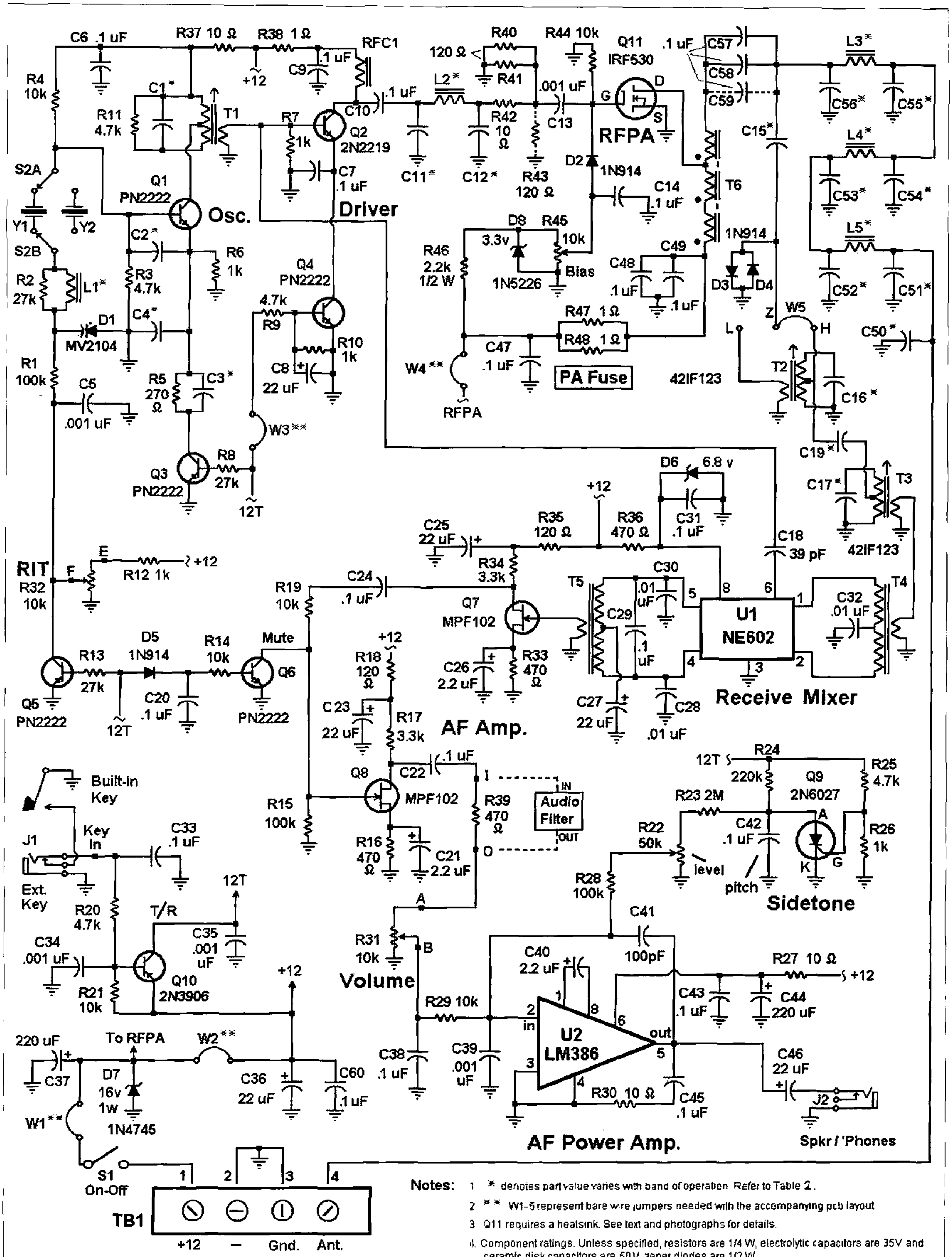


Photo A. Finished version.

SP-5 Condensed Parts List	
C57–59	0.1 µF 100 V ceramic disc
D1	MV2104 or equiv. tuning diode
R22	Mouser 32AG405 PC trimpot, 50k
R45	Mouser 32AAG401 PC trimpot, 10k
S1–S3	Mouser 10SM002 DPDT slide switch
T1–T3	Mouser 42IF123
T4	16T #28 enam. bifilar wound secondary on FT37-61 ferrite core. Primary is 8T #28 enam.
T5	Mouser TL021 audio transformer
T6	10T #24 enam. trifilar wound on FT50-43 ferrite core. Windings cross-connected in series aiding.
TB1	Mouser 534-4190 4-lug terminal board
U1	NE602 IC
U2	LM386 IC
Y1–2	Fundamental-type crystal in FT-243 or HC17/U or equiv. holder. P.R. Crystals, 2735 Avenue A, Council Bluffs IA 51501, (712) 323-7539; JAN Crystals, 2341 Crystal Drive, PO Box 60017, Ft. Myers FL 33906, (800) 526-9825

Table 1. Condensed parts list.



Notes:
1. * denotes part value varies with band of operation. Refer to Table 2.
2. ** W1-5 represent bare wire jumpers needed with the accompanying pcb layout.
3. Q11 requires a heatsink. See text and photographs for details.
4. Component ratings. Unless specified, resistors are 1/4 W, electrolytic capacitors are 35V and ceramic disk capacitors are 50V, zener diodes are 1/2 W.

Fig. 1. Schematic diagram.

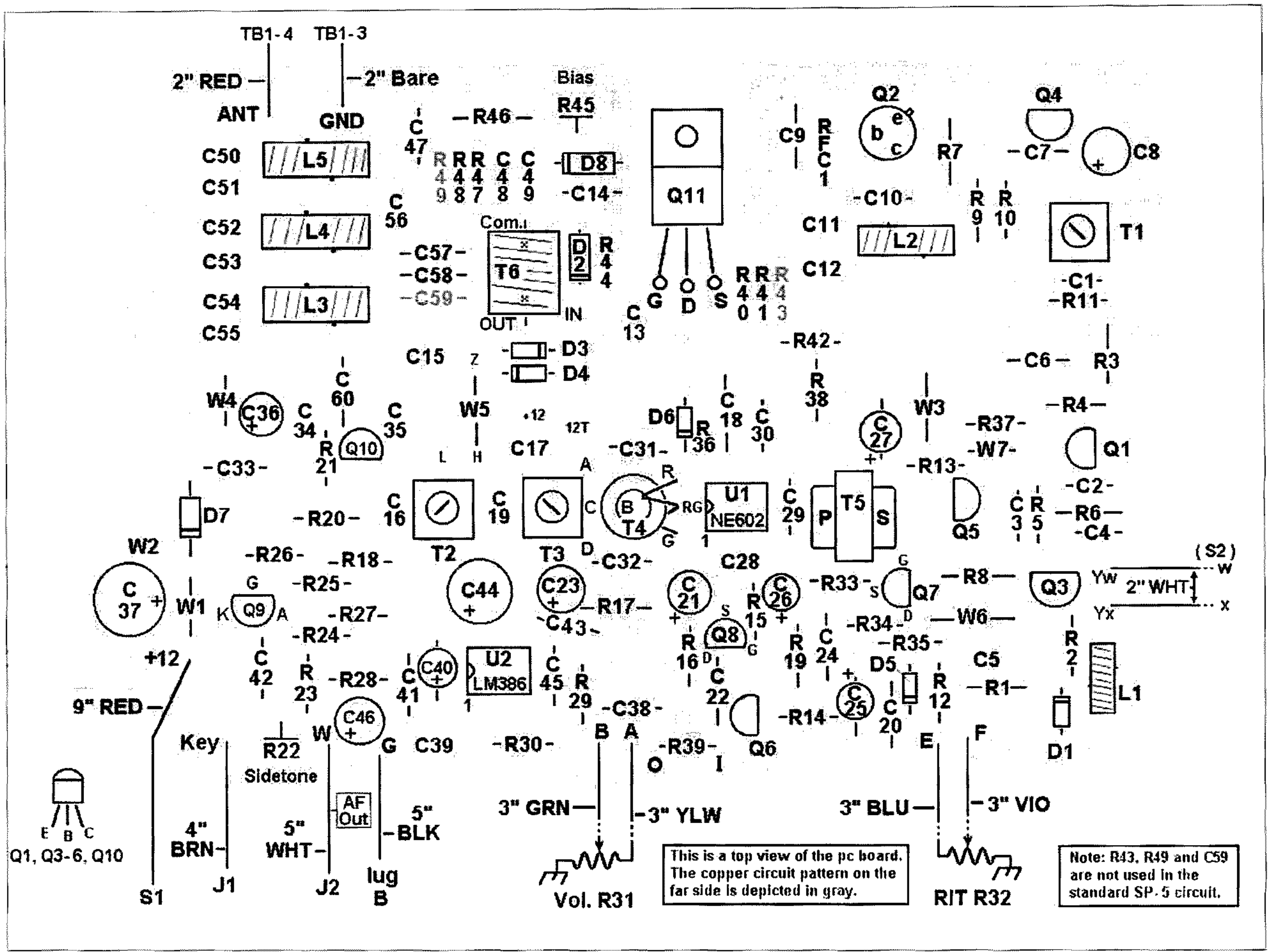


Fig. 2. Top view of PC board.

Big rigs draw a lot of juice, even in receive. It's all that luxurious circuitry that you really don't need, especially when you're not competing with kilowatt-level signals. Choose the appropriate band, put up a good antenna, and low power gets out just fine most of the time. It won't drain your battery nearly as fast. But if your battery is sagging under the heavy traffic load or scarcity of bright sunlight, crystal frequency control will help keep you from chirping too severely, if not transmitting 20 kHz away from where you thought you were! Your sked buddies will still be able to find your signal.

So that's what is offered here in the SP-5 "Senior Spider." It's a simple, stable, crystal-controlled CW transceiver that runs nicely off a small 12 volt battery and operates on your choice of 80, 40, or 30 meters. Power output is in the region of 4 to 5 watts depending on battery charge condition and band (less on 30m, more on 80m). It draws only about 30 mA during receive. Of course, it will also run nicely on a regular AC-powered 13.8 VDC power supply when the lights are on!

Photo B. Stuffed PC board.

If you take a look at the schematic diagram in **Fig. 1**, you'll see that while simplicity is claimed, it is not so simple that performance and operating convenience are sacrificed. Though just one fundamental-type crystal is required for operation (FT-243 or equivalent holder), two may be plugged into the top panel octal socket. This gives you quick QSY from, say, net frequency to a traffic working frequency down the band a bit. Miniature crystals with wire leads also work fine if you can rig a way to plug them in. I modified the base of an unneeded octal vacuum tube to serve as a plug-in adapter for oddball crystals. While the rig is indeed crystal-controlled, you do need fine tuning during receive. This is provided by the RIT potentiometer R32, which varies the voltage on tuning diode D1 in the oscillator whenever the unit is not keyed.

During receive, oscillator Q1 feeds the double-balanced mixer U1 via C18. In terms of sensitivity and immunity to overload, this mixer circuit is far superior to earlier versions I've tried. Antenna signals from TB1 pin 4, via L5, L4, L3, C15, T2, T3, and T4 are mixed down to the audio range in the NE602 at U1. Q7, Q8, and the LM386 at U2 provide audio amplification to a level suitable for headphones or a small, efficient speaker. The type designed for use with a portable cassette or CD player is ideal.

When you close the built-in telegraph key (or external plug-in key, keyer, or bug) to transmit, Q5 grounds the RIT tuning voltage and Q6 mutes the receive audio line. Sidetone generator Q9, a unijunction transistor circuit, feeds the LM386 audio power amplifier so you can monitor your sending. R22 sets the sidetone level and C42 may be altered to vary the pitch. Up in the RF department, Q4 keys the driver stage at Q2 and its output feeds the RF power amplifier, an IRF530 at Q11. Though it just loafs along at this power level, it is nevertheless mounted to a small block of aluminum heat sink which is screwed to the bottom of the enclosure panel—which is also aluminum in the case of the type shown, a Radio Shack #11907656 measuring about 8 inches wide by 5 inches deep by 2-1/2 inches high. Any similar case or box with an aluminum top should

SP-5 Band-Sensitive Component Values			
Part. No.	80m	40m	30m
C1, C16, C17	390 pF	68 pF	not used
C2	18 pF	5 pF	not used
C3	680 pF	180 pF	not used
C4	820 pF	680 pF	390 pF
C11, C12	820 pF	390 pF	270 pF
C15	68 pF	10 pF	7 pF
C19	39 pF	7 pF	5 pF
C50, C56	390 pF	270 pF	180 pF
C51	68 pF	not used	not used
C52, C54	820 pF	680 pF	68 pF
C53, C55	390 pF	not used	390 pF
L1, FT37-61 core	40T #30	24T #28	17T #28
L2, T50-2 core	22T #24	14T #24	12T #24
L3, L5 T50-2 core	22T #24	17T #24	14T #24
L4 T50-2 core	25T #24	19T #24	16T #24

Table 2. Band-sensitive component values.

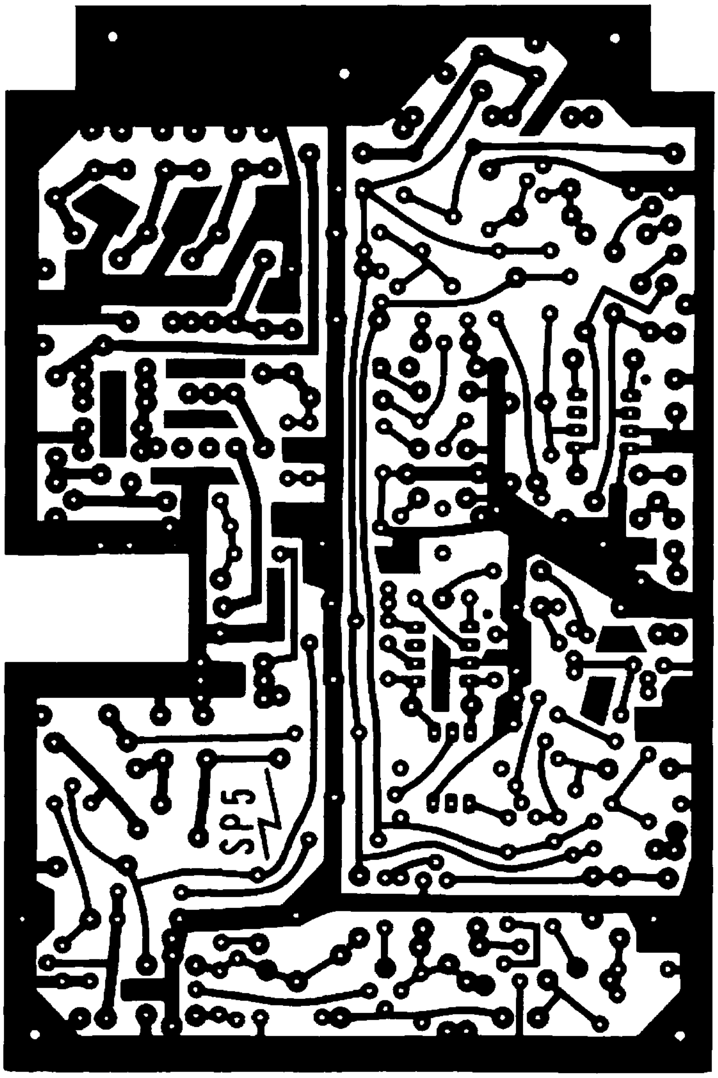


Fig. 3. Full-scale PC board etching pattern.

do the job as well. By the way, that built-in telegraph key is just a brass strip on spacers with a rubber equipment foot for a knob. It grounds the insulated contact below when you send.

Back at the RF power amplifier, bias control R45, a PC-type trimpot, may be set at max for full power or cranked down if you feel less is called for and want to conserve battery. Quarter watt resistors R47 and R48 actually serve in this circuit as cheap fuses. The output impedance of Q11 is stepped up to the vicinity of 50 ohms by T6, an RF transformer consisting of 10 trifilar turns of #24 enamel-coated wire wound on an Amidon FT50-43 ferrite core. L3, L4, and L5, along with associated capacitors, form the antenna lowpass filter, cleaning up the signal before it exits the rig at TB1 pin 4.

Most of the parts for the SP-5 (with values listed on the schematic) mount on the PC board as shown in the parts overlay provided in **Fig. 2** and full-scale etching pattern in **Fig. 3.** Parts with values depending on the band of operation are listed in **Table 2.** After wiring the PC board to the operating controls, jacks, and switches on the top panel, the finished PC board is mounted copper side to the top panel on half-inch metal spacers to be clear of the panel parts below. Short leads from the PC board to crystal select switch S2 may then be made, as well as the short ground and antenna leads to pins 3 and 4 of TB1.

Connect a dummy load and wattmeter to TB1 pins 3 and 4. Connect 12 to 13.8 VDC (with a 1 amp inline fuse) to TB1 pins 1 (positive) and 2 (negative). Key the rig and adjust T1 for maximum RF output. Set bias control R45 to desired power level. Replace the dummy load with an antenna and adjust T2 and T3 by ear for best reception. Or use a signal generator set to the crystal frequency if you have one.

There's an In-Out switch on the cover panel intended for use with any small audio filter module. With two poles on the switch available, one side can be used to select filtered or unfiltered audio and the other can be used to switch on 12 volt power to the filter when it's in use.

Under normal conditions, crystal control may seem like operating with your hands tied even though some of us enjoy that! But if the chips are really down and power hungry high-tech rigs are collecting dust, you may discover how nice it is to be solid as a rock, like a lighthouse on a treacherous coast, while others are drifting around. Crystal up now with your friends and you won't get lost in a sea of noise!

Notes

1. For the latest info on crystal sources, send an SASE to me at the address above.

2. For a one watt "Spider," see the January 1993 issue of *73 Amateur Radio Today.*

3. The SP-5 "Senior Spider" is available as a kit for $69.95 less case, or assembled and tested (indicate band) for $124.95 including case and audio filter. Add $6.00 for shipping to USA and Canada. Order from Lectrokit, 401 W. Bogart Rd., Sandusky OH 44870. E-mail address for questions/comments: [lectrokit@sanduskyohio.com].

Long Beach Longwire

You're really *"on the air" with this beach kite antenna.*

Hank Landsberg WB6MEU
503 Key Vista Drive
Sierra Madre CA 91024

As a ham with a "big-city" QTH, it's nearly impossible for me to put up an HF antenna of any significant size. Even a compact yagi is difficult, with the small yards typical of southern California homes. An idea came to me as I was spending a summer day on a breezy beach: Why not let the wind hold up a longwire antenna? A few days later, I was operating 40 meters SSB with my "beach kite" antenna!

The trick to getting a simple, inexpensive kite to support several hundred feet of antenna wire is to use lightweight wire. Even very small gauge copper or aluminum wire is heavy, if you use 500 feet of it. I needed wire that was both very light in weight and also strong enough to hold together under the tension of being held aloft by a kite in a brisk wind. Luckily, I have discovered the ideal kite antenna wire: "polywire" (sometimes spelled "poliwire"), a product usually used for electric fences.

Polywire, made by Stafix Electric Fencing LTD and Gallagher LTD, both of New Zealand, is a composite "wire" that is actually mostly polyester. It is about 0.060" in diameter, very strong,

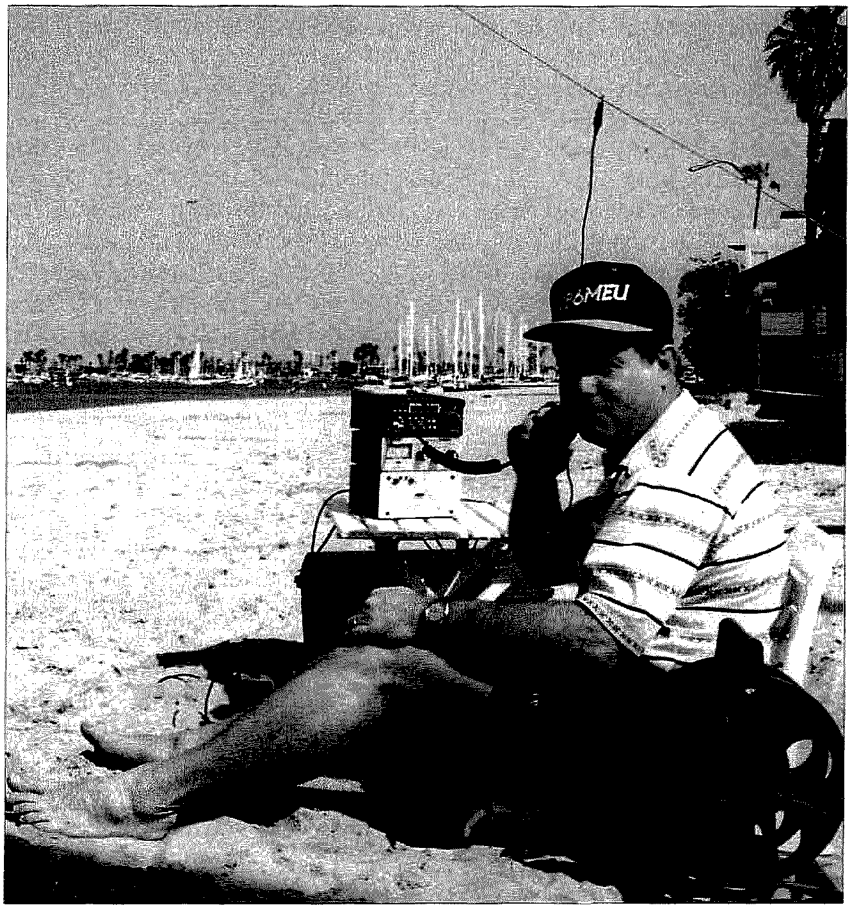


***Photo A.** WB6MEU operates from Alamitos Bay at Long Beach CA. Spool of polywire in foreground. (Photo by Ernie Williams WB6BAP.)*

Photo B. SCG radio, MFJ tuner, and power supply. (This and succeeding photos by author.)

and very lightweight. A typical 200-meter (660-foot) spool of polywire weighs less than 1 lb. Woven through the polyester material are six strands of thin stainless steel wire, making polywire electrically conductive. The wire strands have a diameter of 0.006", and with a combined diameter of about 0.020", polywire is equivalent to #26 stranded wire. The advantage of polywire is its strength: It is much stronger (but not heavier) than the #26 wire that it supports.

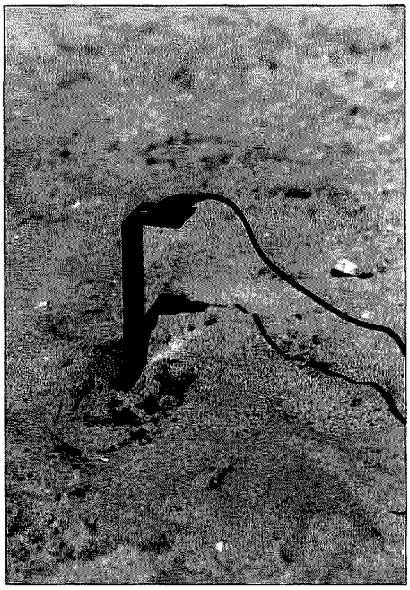


Photo C. Ground stake connects to tuner.

Now that the "radiator" problem was solved, I needed a kite to "hook it" to the sky. A trip to the local kite store provided a simple and inexpensive "delta-wing" kite, which cost about $30. The kite has a wingspan of about 5 feet, and is easy to transport. Delta-wing kites are known for their efficiency and stability. They will fly with a minimal breeze and, once aloft, they just "hang in the sky" without zigzagging back and forth. (Having a 500-foot "tail" certainly helps!)

Constructing the beach kite antenna took about 3 minutes, since there wasn't much to build. The only item left to improvise was a means of anchoring the kite to my operating position. I assembled a "bungee-insulator" using a 2-foot length of bungee cord with a snap-ring at each end. One end of the cord would attach to the "radio end" of the polywire; the other end of the cord would be anchored to anything heavy enough to anchor the flying kite. The bungee-insulator also electrically insulates the antenna from the anchor, and provides some mechanical shock isolation to absorb the varying tensile forces on the polywire.

With the kite, polywire (wound onto a plastic extension cord reel), my QRP radio, antenna tuner, batteries, and lunch, I was ready to fly the kite, tune up, and call CQ. A steady breeze was blowing off the Pacific Ocean at Alamitos Bay in Long Beach CA. The kite took off immediately; I let out about 400 feet of antenna wire. The polywire was secured to the frame of my chair using the bungee-insulator. A clip lead connected the antenna to the "longwire" output of my MFJ-971 QRP antenna tuner. A ground for the tuner was provided by pushing a steel "L" bracket into the sand, connected with another clip lead to the tuner's ground terminal. My rig was an SGC SG-2020 multiband SSB transceiver, operating on batteries.

I tuned up on 40 meters; the tuner was able to provide a 1:1 match to the antenna. A few CQ calls resulted in numerous contacts throughout the country, plus a few in Canada! All this on 5 watts of power, SSB ... and no neighbors complaining about an ugly tower

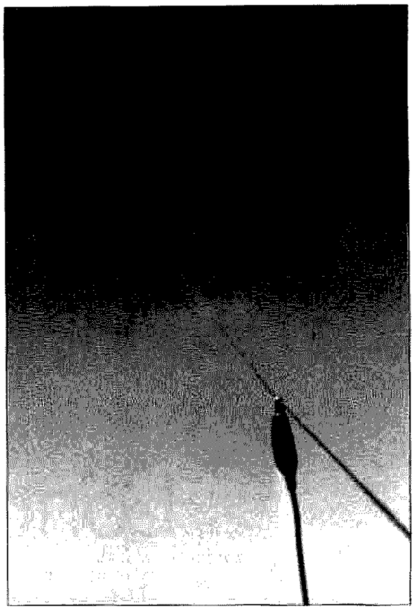


Photo D. Clip lead connects polywire antenna to tuner.

or TVI! After a while on 40m, I switched to 20m ... and discovered that the antenna was too long for the MFJ-941 to tune due to excessive reactance (at 400 feet). I wound in the kite to about 150 feet, tuned up, and got a 1:1 match. I worked about a dozen stations on 20m, getting several good signal reports from the East Coast. (One ham had a hard time believing that I was QRP!)

The only glitch was caused by static buildup on the antenna. Every 30 seconds or so, static buildup would cause a discharge across the tuning capacitor in the tuner, resulting in a loud "POP" in the SG-2020 receiver. At worst, this could damage the front end of the receiver; at best, it caused the receiver AGC to knock the audio down by a few dozen dBs each time there was a static discharge. The cure for this annoyance was to install a 1-megohm (1/4-watt) resistor between the Antenna (output) and Ground terminals of the MFJ tuner. The 1-megohm value provides sufficient DC leakage to dissipate the static charge buildup on the antenna, yet it's a high enough value to "bridge" the RF on the antenna without any adverse affect on its tuning or resonance. After installing the resistor, there were no problems with static pops.

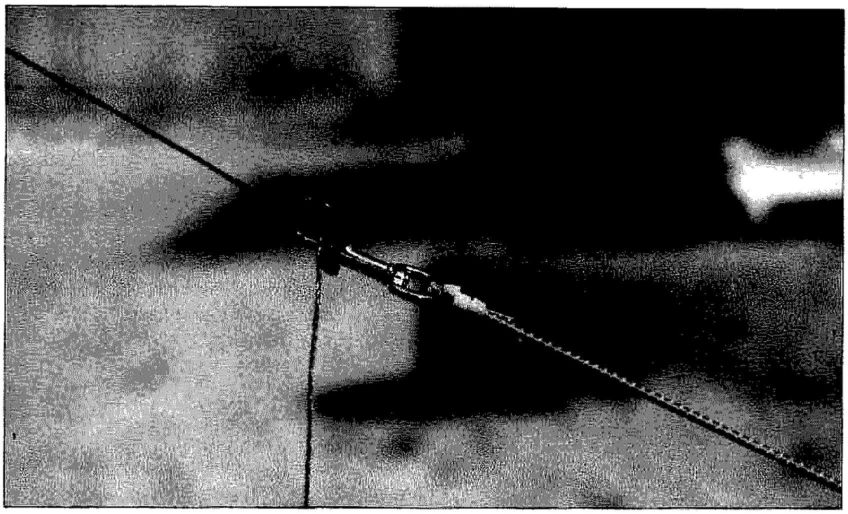


Photo E. Bungee-insulator secures antenna and isolates it from anchor point.

Power for the QRP station was provided by a modified MFJ-4114 portable power pack. This unit normally contains ten 1.5-volt "D"-size NiCd batteries, to produce 15 volts of output. The problem I found with this design was that the slightest amount of physical shock would cause the batteries to "spring loose" from their holders. Also, my SG-2020 won't operate well if the supply voltage drops below 12.0 VDC. I fixed these problems by modifying the MFJ-4114, removing the D-battery holders, and installing two 8-volt (3.2 Ah) sealed lead-acid rechargeable ("gel-cell") batteries connected in series (Power-Sonic Corporation, type #832). They provide 16 volts DC fully charged, and allowed the SGC radio to operate for several hours before dropping below the 12 volt limit. The other advantages of these batteries are that (a) they are much more secure than 10 D-cells, (b) they don't have the NiCd "memory effect," and (c) they're more reliable than 10 batteries connected in series with spring connectors.

I have used my kite antenna for over a year now with great results. It's lots of fun operating on the beach ("that's SANDchair copy, OM!"), and my portable station usually prompts a few questions from curious onlookers ... a great way to explain what amateur radio is all about, and why it's more interesting than making a call from a cell phone!

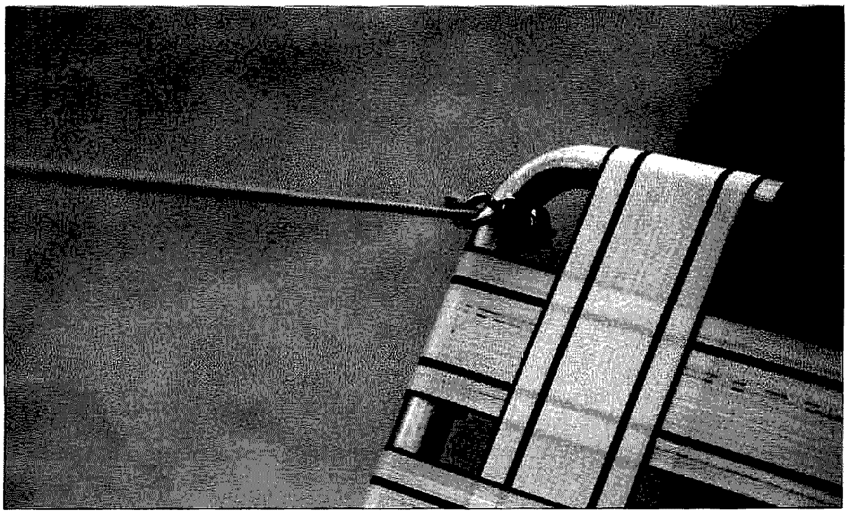


Photo F. Other end of bungee-insulator is tied to operator's chair.

Locating polywire can be tricky if you don't live where there are farming materials suppliers. Try calling feed and tack stores, or these polywire manufacturers (Web sites listed in brackets):

Stafix Electric Fence, Ltd.; (530) 743-9045 (located in California); [www.stafix.co.nz].

Gallagher Power Fence, Inc.; (800) 531-5908; [www.gallagher.co.nz].

For batteries, try:

Power-Sonic Corporation; (619) 661-2020 (located in California); [www.power-sonic.com].

You, Too, Can Be an SOB

continued from page 27

in groups larger than one, lest the enormity of our cumulative strangeness become apparent to others or, worse, obvious to ourselves.

The SOB constitution, therefore, requires members to avoid face-to-face meetings with other amateurs. This is our only caveat, and SSTV and FSTV operators are obviously ineligible. There are no initiation fees, no dues, and above all, no meetings to attend. In fact, if any SOB goes to any kind of amateur social affair anywhere, he is subject to instant expulsion. And so compliant with this rule are we that none of us ever has been expelled. "Once an SOB, always an SOB" is our motto.

So how do you join?

Membership is by over-the-air invitation only. Any amateur holding any class of license anywhere in the world is welcomed (SSTV and FSTV ops aside) so long as he swears on the memories of Hertz, Steinmetz, Phelps, and The Old Man himself to abide by the no-meetings rule.

(Phelps, Herman W., ex-1XGZ, for the benefit of those who may not be thoroughly schooled in early amateur lore, was the first licensed ham operator to fracture his skull on an attic rafter while jerking his lip away from an RF arc drawn off a carbon microphone loop-modulating a self-excited 210 on or near 160 meters.)

Continued on page 42

You, Too, Can Be an SOB

continued from page 41

To join, find a member to sponsor you, and vow to avoid personal meetings with other hams (unless you have some in your immediate family; the rules allow limited contact with licensed kin). If he agrees to be your SOB-father, you are in.

So how do you find us?

Just start asking each of your contacts hereafter—on phone, CW, or RTTY and on whatever band—if he is an SOB. Non-members usually will deny it. Now and then you may even run across a guy who'll mutter nasty comments about you and break off the QSO. But sooner or later you will run across a real member of the Solitary Operators' Brotherhood eager to make you one as well.

"Welcome aboard, you SOB," he'll tell you. "Now you are one of us."

And then you will know you have become a real SOB, pledged to carry on the almost-forgotten tradition of the old-timers who labored alone to contrive their magical visits with others out there, unseen, unmet, unrecognized for what they were and what we are today—scruffy humans with runny noses, rumpled clothes, and scratches on our gear.

QRX

continued from page 6

but Finagle's Laws on Information apply equally to understanding intricate financial transactions: (1) The information that you have is not what you want. (2) The information that you want is not what you need. (3) The information you need is not what you can obtain. (4) The information you can obtain costs more than what you want to pay.

The difference between rich and poor is sharply caught by Getty's Reminder that the meek shall inherit the Earth—but not its mineral rights. Followed by the Golden Rule of Arts and Sciences: Whoever has the gold makes the rules. Donohue's Law says that what's worth doing is worth doing for money. And then there's Goldfarber's Law, that under any system a few sharpies will always beat the rest of us.

On pocketbook matters, everyone has to keep his eyes open. It's Gross's Law that when two people meet to decide how to spend a third person's money, fraud will result. As in O'Doyle's Corollary: No matter how many reporters share a cab, and no matter who pays, each puts the full fare on his own expense account.

Woody Allen said that the lion shall lie down with the lamb, but the lamb won't get much sleep. To which you may add Clopton's Law: For every credibility gap, there's a gullibility fill.

The Checkbook Balancer's Law holds that in matters of dispute, the bank's balance is always smaller than yours. But if you think the problem is bad now, Epstein adds, just wait until we've solved it.

Finally, Quinn's Law: The reader interest generated by any newspaper column is inversely proportional to the importance of its subject.

Tnx and a look out for Wordsworth's Whim (the better the writing, the greater the chance the author's name will be spelled wrong) to Anrold Smith KA3NTZ, via *X-Mitter*, newsletter of the Penn Wireless Assn., Howard Rubin N3FEL, editor.

Forgotten Rules of English

Several editors have asked for an occasional article on how to improve the grammar in their publication. Here are several very important but often forgotten rules of English, original source unknown:

1. Avoid alliteration. Always.
2. Prepositions are not words to end sentences with.
3. Avoid clichés like the plague. (They're old hat.)
4. Employ the vernacular.
5. Eschew ampersands & abbreviations, etc.
6. Parenthetical remarks (however relevant) are unnecessary.
7. It is wrong to ever split an infinitive.
8. Contractions aren't necessary.
9. Foreign words and phrases are not apropos.
10. One should never generalize.
11. Eliminate quotations. As Ralph Waldo Emerson once said: "I hate quotations. Tell me what you know."
12. Comparisons are as bad as clichés.
13. Don't be redundant; don't use more words than necessary; it's highly superfluous.
14. Be more or less specific.
15. Understatement is always best.
16. Exaggeration is a billion times worse than understatement.
17. One-word sentences? Eliminate.
18. Analogies in writing are like feathers on a snake.
19. The passive voice is to be avoided.
20. Go around the barn at high noon to avoid colloquialisms.

Tnx and happy proofreeding to the ARNS *Bulletin*, Steve Auyer N2TKX, editor.

(And then there was the *73* job applicant who emphasized his skill with "grammar, spelling, and puncuation" ... and the prospective editor who looked forward to meeting us "one of these day"—ed.)

Rules of Radio

- There shall be no talking by the family during a QSO.
- The XYL or XOM shall assist with antenna construction when and *only* when required.
- The shack budget will take precedence over all other incidental items, such as mortgages, food, etc.
- Birthday presents, anniversary gifts, or Christmas stocking stuffers for the OM or YL must include at least two items for the shack (total value of not less than $300).
- Flea markets, hamfests, and Field Days overrule family holidays.
- Furry pets are not allowed near the rig (except for testing purposes).
- TVI never occurs within the home, or if it does, is negligible and does not count.
- All trees around the QTH shall be considered antenna supports, and not "greenery," "landscaping," or other such nonsense. Corollary: Any tree may be cut down, pruned, poisoned, dug up, or otherwise removed, should it be in the way of wire.
- The last postage stamp and envelope in the home shall be reserved for direct QSL mailings, and not for personal letters, bills, or mail orders (unless orders are for shack).
- Any number of holes may be drilled in the family car to accommodate mobile whips. Corollary: Coax may droop across the steering column occasionally.
- Never herewith shall insurance coverage of shack items be less than triple the replacement value, notwithstanding acts of God.
- Newly licensed hams must honor, praise, look up to, ask easy questions of, and purchase coffee for old guys.
- The XYL or XOM shall anticipate good band propagation conditions at all times, and whenever rare DX flows in shall, without fail:
  a) keep log when requested;
  b) hold all phone calls—except those from other hams;
  c) call the OM's or YL's work QTH the next morning and cover an absence with a good excuse;
  d) appear very excited;
  e) change all plans to suit;
  f) provide steaming coffee at 45-minute intervals;
  g) cancel all household chores—in particular, vacuuming or lawn mowing.
- All materials owned by the work QTH can and will be used for ham projects. Corollary: If you cannot convince work QTH to donate items for the shack, you shall quit said despicable workplace without notice. Simply QRT hastily.
- These rules may be modified at any time, without notice, to be continuously in the OM's or YL's best interest.
- The most recent licensee must bear the brunt of our collective teasing until the next new licensee fills their humiliated shoes.
- All members of all radio clubs must support,

Continued on page 57

Number 43 on your Feedback card

Above & Beyond

VHF and Above Operation

C. L. Houghton WB6IGP
San Diego Microwave Group
6345 Badger Lake Ave.
San Diego CA 92119
[clhough@pacbell.net]

Looking for Project Gigantic

That's what it is all about—looking for that ARC-5 with the 1625s or whatever type tube it was that could be converted by sawing the Bakelite socket next to pin 3 and separating the cathode and a screen grid of the tube. That was the rage in the early '60s—to get some inexpensive power on the low bands for SSB operation. Remember some of those early rigs using RF and audio phasing to achieve SSB with rather large circuitry and vacuum tubes?

Well, in my case, that was what got me interested in soldering irons and all the destruction that they could wreak havoc on in my early years. It seemed that almost all of the circuits and equipment were too costly for the average amateur to purchase. That led to a plethora of surplus outlets that had material (in large quantities) available for conversion from military usage during the '40s and '50s.

It seemed to be a standard event to travel to these candy stores and see what we could come home with. We sifted through, looking for a familiar and friendly piece of electronics that would lend itself to conversion into something useful that we wanted. High current 28 volt transformers and such were in high demand, as almost all military power supplies used required 28 volts to function. I even remember (before the 28 volt transformer became available) using a large string of 2 volt batteries to power some of the current-hungry behemoths such as the ARC-2 HF transceiver with its motor driven autotune.

If I made a mistake and activated the autotune circuit, it drew so much current that I had to recharge my battery string, as it would suck it nearly dry. Now all of this seems like I am capping on myself, but this is much like all other learning experiences. As Thomas Edison said, "Have I had any success? Why, I know a thousand things that will *not* work." The same is to be said for our stick-to-itiveness in forever scrounging and stocking our junk boxes to save hard-earned cash for that project we want to construct, be it for standard CW or SSB or some other sophisticated piece of gear that could be used to get into RTTY or even ATV.

For RTTY, in the early days there was the military surplus URA-8 converter. This was a premium converter that was costly even when in surplus. That made it a RTTY converter to be dreamt about. A more likely conversion was to assemble a converter out of home-constructed parts using some 88 millihenry old telephone "load" coils to make filters for the mark and space frequencies of 2125 and 2975 hertz. That gave an 850 hertz shift for mark and space, standard in early years.

Not too many years later, 850 hertz was considered old hat, with 170 or even 45 hertz shift being standard in high end systems. Today there are lots of circuits that use these modes, but most utilize high end computers and other types of data networks to pass information on in speeds that run circles around those early RTTY setups.

Enter today's amateur's ham shack, and you'll see that there is quite a technology shift from those early beginnings to the very sophisticated amateur equipment and modes of communications used today. Compare one item that I used, a Hallicrafters shortwave rig using about 9 vacuum tubes in an HF receiver, to my IC-820 dual-band VHF transceiver.

The older receiver could be repaired with a small selection of capacitors and a few vacuum tubes for quick substitution when performance dropped off, or other troubles developed as time went on.

In comparison, the ICOM IC-820: I ordered the service manual and should have taken time to figure out how computer-controlled the entire circuitry was. When looking at the service manual and at the internal circuitry in the cabinet that housed the VHF transceiver, I was disappointed to discover that I was looking more at a computer than at what I call a radio.

Today's radios are so accurate that you do not have to have a frequency counter to maintain them on frequency. They just operate and operate. The biggest trouble is that many years down the road, they might need a battery replacement in the memory hold circuit to keep them ticking. This is different from the old Hallicrafters receiver that I am now trying to restore. Seems the parts procurement program has gone full circle in this arena.

To me, that's what amateur radio is all about: building and repairing equipment for amateur operation *and* repairing test equipment. Now, we all would like to have pockets deep enough to allow our beer budgets to function at a much higher level—similar to where we would be if we had just won the lottery. Unfortunately, that is not the case for me and a lot of other amateurs. That's why we have

become great scroungers of surplus material.

This should allow you (as it has for me over the years) to stock up on various pieces of electronics to either convert into something or to use for parts scavenging. It's great to stock up the station's junk box to a level that allows you to dig into its depth to locate parts to save you cash in construction projects at the merest hint of an idea, or to test a theory, or to make a simple adapter without having to run to the local candy store and spend not only the gas and time but also the additional cash—making that $2.75 item really cost quite a bit more considering the time and effort needed to get it.

My pitch: Stock the junk box with raw materials as you find them. Don't try to start a museum, but stockpile valid components that can be used to advantage. When you run across small aluminum boxes or cabinets and the price is right, pick them up. Pick up PC boards that have components that can be used for interface or regulator and linear applications.

For interface or driver applications. FETs of a power nature are good materiel to acquire, as are many different types and ratings of voltage regulators. Just this one item can be so handy when constructing small projects. In the linear applications, audio amps, op amps, and such can be quite useful. As far as components to support these items go, stock up on various values of electrolytic capacitors for bypassing and filtering power supply circuits.

Lots of values abound, but 0.01, 0.001, and 0.1 µF capacitors are those most used, in addition to a variety of values from a few pF up to 1000 pF or .001 µF for RF applications. As a general rule, I try to stock up on the little red mica capacitors, as these are a better cap than disc ceramics in most RF applications. In either case, it's just taking what you can locate for little cash investment. You're stocking up a junk box to build things out of, not stocking up Fort Knox.

As far as resistors are concerned, look for a bargain on an assortment or build your own assortment box up. I started out by *not* making a 200 drawer cabinet for my selection of resistors, as then I would be spending more on the compartments to house the resistors than the resistors were worth. Keep the junk box in perspective—it's supposed to save you money. If you only have a small selection, sort them out into 10 different categories according to the last color code band on each resistor.

In this way, you only need 10 compartments to house all resistors. Label them 1 through 5 or so, reflecting the value of the color of the last band, black = 0 for the first box, brown = 1, red = 2 , and so on. This makes the first box values from zero to 99 ohms (fudge and call it 100 ohms). The next box, brown, will be 100 to 1000, and so on. Do you realize that if you sort this way you only need a few boxes, because when the values get into the megohm range, they're not used much. You might as well toss them into the same bin or box. The most common values used are in the 100, 1000, 10k, 100k, and 1 meg ranges, as well as the very small fractional values under 10 ohms.

When you have assembled a larger collection of components and need a better sorting arrangement, try using coin envelopes from your stationery store. A box of several hundred costs only a few dollars. Using the envelopes, I sort all resistors out by value and place similar values in the same envelope, like 470 ohms. All resistors are now sorted by value in these envelopes, making component part selection quite easy.

The same can be said for capacitors and transistors, as well as for both signal and rectifier diodes. If you put your components in coin envelopes, when you sit down to stuff a PC board all you need is these coin envelopes in a few boxes over your workbench to select from. I would not recommend placing very large capacitors in envelopes, as the coin envelopes are only very well suited for smaller components. With larger ones, they become cumbersome due to excessive stuffing (bulging at the seams).

Now there seems to be only one item left in stocking your junk box, and that's where do you find bargain components? Well, this can be a difficult question if you are located in a farming community or other non-industrial area. In many cases, I would rather trade my prime scrounging grounds for a very peaceful farming community any day. In reality, amateur swap meets and some surplus dealers are quite good sources. Just watch what you have to pay for any item. As with any transaction, you have to weigh what use you have for the item with the investment involved. Swap meets are the best places to try to find that pot of gold, that something you are just salivating for, without tipping your hand on how badly you want the item.

If you find the exact item you have been looking for, don't, for heaven's sake, state, "I have been looking for this for 10 years." That will immediately raise the price from reasonable to quite expensive. Swap meets are a blend of the bargain hunters and a few predators selling snake oil. Mostly they are quite honest folks offering for sale items that they have no more use for. Some are in it for a professional business venture and push the prices up. I have observed many transactions occurring early in swap meets as the serious dealers go on the prowl, looking for super bargains and trying to pick up everything that is priced to move cheaply. These items are picked up as sellers are setting up or on the way in. Such buyers rove the drive-in line and ask for specific items before the meet starts.

I have seen these dealers then transport the item to their stall or table and re-offer it at an inflated price at the same swap meet. Here is where you have to watch out for paying too much for an item. You don't know that this dealer has just picked up this, let's say, Tektronics 485 350 MHz dual-trace o-scope for $50 at this swap meet from a neighboring seller. When you are dealing with this dealer, what representations can he make that will be able to truthfully answer your questions about how the scope works? Listen to his responses, such as, "As you can see, it looks to be in great shape. Look, even the calibration sticker, it's only one year old." But has it been plugged in and does it put a trace on the screen? Can you take it and plug it into a nearby outlet and give it a test to see if it's "alive"?

You are in a push-pull scenario of events here. In this case, I would say that if the unit is alive, what is the cost and can I perform a quick test? Some security for both the seller and buyer is quite reasonable. Most sellers who do not know me have accepted my driver's license info copied to a business card as security for a 10 minute test. Some have wanted cash to hold things until I return.

Here is where the interest in the item and the mutual trust between seller and buyer need an evaluation. I have only been bit once, but it's quite enough. I returned with a test set that did not function and for which I had paid a premium price—and the dealer was gone, never to be seen again. I suspect that a check that could have been stopped should have been my tool here.

Don't get caught up in the emotions of picking up something, only to get wrapped up in a bad deal. Just be aware of things and don't pay the farm for something that you have been wanting for the last 10 years only to find out when you have time to evaluate it properly that it's better as a doorstop.

Swap meets are an excellent place to acquire items to stock a junk box. Just do it gently and use cost effectiveness in making purchases. After all, you are supposed to save money, not spend it like there is no tomorrow.

Number 45 on your Feedback card

HAMSATS

Amateur Radio Via Satellites

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Two up, one on

Good news and bad news. UoSAT 12 and RS-19 were placed in orbit in April. The latest offering from the University of Surrey in England is doing well, but the Russian/French hamsat was never turned on. UoSAT 12 is now known as UoSAT-OSCAR-36. It is a rather large hamsat with many advanced digital experiments. RS-19 was built in France to be the third Sputniklike commemorative hamsat, hand-launched from the Russian *MIR* space station. The March Hamsats column provides a look at the designers and builders who made RS-17 and RS-18. They were also responsible for RS-19, but not the ensuing international problems. Somehow, a hamsat had been hijacked by the commercial world, modified as a flying advertisement, and sent to *MIR* for later launch.

RS-19/Beatnik/Swatchsat

We have cellular telephones for business and VHF/UHF handie-talkies for our amateur-radio hobby fun. We have geostationary TV satellites for commercial broadcasts and the OSCAR (Orbiting Satellite Carrying Amateur Radio) series of hamsats as an extension of ham "hobby" radio. Commercial and amateur radio are two separate entities that are not supposed to mix.

The Swatch Corporation [http://www.swatch.com], known for their innovative line of watches, seemed to think that they could buy advertising in space on ham frequencies. Virtually all amateur-radio satellites have some form of sponsorship or donations from government, educational, or commercial sources. Money from the pockets of hamsat enthusiasts is just not enough to design, build, and launch satellites, but Swatch went too far with Beatnik.

RS-19 was designed as an amateur-radio satellite to store voice messages for broadcast from orbit on two-meter FM. Per the terms of a contract between Swatch and the Satellite Control Center in Moscow, the Swatch Corporation of Switzerland defined the message content. The Swatch Beatnik messages were clearly commercial and designed to promote Swatch and its Internet Time via the "beat" theme.

When the amateur community heard about the transformation of RS-19 into the Swatch Corporation Beatnik, three distinct groups formed. The first group reacted to Beatnik as a near-criminal interloper in the ham realm. They sent E-mail everywhere they could, including to Swatch. The second group said little, but considered the possibility that hams could somehow make lemonade from the rather sour situation. Perhaps the messages could be reprogrammed in space, or the satellite could be returned to Earth and reconfigured.

The third group began studying international law regarding the commercial use of amateur-radio spectrum. Representatives of various national and international organizations, including AMSAT-NA, AMSAT-France, AMSAT-Russia, and the American Radio Relay League, sent information to Swatch and the Russian launch authorities explaining the legal problems surrounding Beatnik.

On April 16, 1999, RS-19/Beatnik/Swatchsat was hand launched by Jean-Pierre Haignere from *MIR*, but the satellite was not turned on. Later in the day, Jean-Pierre stated via radio from *MIR* that he had received instructions not to turn the satellite on because it was carrying advertisements that did not comply with amateur regulations.

Up until the last minute, AMSAT-France attempted to convince Swatch to cancel the commercial end of the project and work a compromise that would give the satellite back to the amateur community. Swatch declined, and decided to literally kill the satellite by launching it dead with power off. Swatch later said on their Web site and in a full-page statement in the *New York Times* that the batteries in Beatnik were being removed from the satellite and donated to the Russian Spaceflight Control Center for use in a printer on *MIR* that had quit due to battery failure.

Did the printer on *MIR* really go down? Could the batteries in Beatnik really be used to save the day? Just how commercial were the Swatch messages? Several years ago, it was decided not to put voice messages from school kids on Dove-OSCAR-17 due to possible conflicts with international law. While the Beatnik/Swatchsat messages look rather innocuous, they are obviously not amateur-radio-related. Here are a few of the messages that had been reportedly programmed into the non-volatile voice chip in Beatnik/Swatchsat:

Let peace beat you, not war defeat you, I just want to hear your hearts beat at their own pace on Earth in the universe.

Continued on page 46

Hamsats
continued from page 45

Let love beat all the wars on our wonderful planet!

Nobody is going to beat me!

Gravity cannot be held responsible for people falling in love. Keep the beat alive.

Let our hearts beat together in a sound of friendship.

You must learn more about technology than it can learn about you. Don't let the system beat us. Advancement without losing privacy.

I will always remember every beat of my heart, 'cause all of them are like a sunset in the ocean or a rainbow in the mountains.

Who's who

In the June issue of *QST* from the ARRL, an item in the "Happenings" column on page 79 rather succinctly describes the events surrounding Swatch, Beatnik, and the amateur-radio community, but with some significant omissions. The text says nothing of the efforts of AMSAT-NA and AMSAT-France to curtail the Swatch activities.

The president of AMSAT-France, Dr. Bernard Pidoux F6BVP, provided some history and insight on the Swatch problem on April 13th. Bernard noted that the RS-19 work began in December 1998, with a contract between Mssrs. Oleg Volkov, Serge Samburov, and Vladimir Soloviev, representing SCSC (Spacecraft Control Center in Moscow), and AMSAT-France. The SCSC wanted a satellite similar to RS-18 to be completed and delivered by February 22, 1999. Items in the contract referring to Internet beat time and a project name of Beatnik were the first indications that something was not right. AMSAT-France signed the contract but made additions specifying that commercial activities were not allowed on amateur-radio frequencies. The SCSC did not honor the modified contract terms. They effectively sold RS-19 to Swatch for use as a marketing/sales tool on the two-meter ham band.

The president of AMSAT-R (Russia), Eugene Labutin RA3APR, made a statement nearly a month earlier in response to messages received from Bernard Pidoux F6BVP. Eugene pointed out that AMSAT-R, while mentioned in the RS-19/Swatchsat/Beatnik contracts, was not involved. None of those signing the contracts on the Russian side had any authority to sign documents of this type representing AMSAT-R. He further stated that only three members of AMSAT-R are authorized to do this: the president and the two vice presidents.

The president of AMSAT-NA, Keith Baker KB1SF, worked with sources within AMSAT to provide the ARRL, the IARU, and AMSAT international groups with information and suggestions. Keith knew who the key players were on both sides and the potential ramifications to the ongoing standoff between amateur radio and commercial interests that would like to have our VHF and UHF allocations.

RS-19/Beatnik/Swatchsat is a loss. Amateur radio supporters kept the commercials out of the ham bands, but the satellite was sent into orbit without power. Swatch went on to promote their "beat" and Internet time theme via their Web site. AMSAT-France will continue with their other hamsat projects. You can find out more about the programs of AMSAT-France on their Web page: [http://www.ccr.jussieu.fr/physio/amsat-france]. An excellent source of information about the Swatch protest and boycott can be found at Rob Carlson's (KC2AEI) site: [http://wmbc.umbc.edu/rob/swatch-protest].

UoSAT-OSCAR-36

UoSAT 12, now known as U-O-36, was launched on April 21st on a converted SS18 ICBM (Intercontinental Ballistic Missile) from a silo at the Baikonur Cosmodrome. The outside temperature at the time of launch was just above freezing, but the UoSAT team from the University of Surrey in England got a clear view of a rather unusual liftoff. The missile carrying the newest hamsat was ejected from the silo by compressed gas. About 125 feet above the windswept Khazak desert plain, the first stage engine fired, propelling the rocket up through an almost cloudless sky. A short while later, the signal came through that UoSAT 12 was in orbit. The General Director of Kosmotras and head of the Russian Strategic Rocket Forces presented the team with a certificate of launch just before the champagne was opened.

The final orbit for U-O-36 is 650 km high, with an inclination to the equator of 65 degrees. A few hours after launch, commands were sent to the satellite from Surrey's control station in England. All systems checked out and the satellite's subsystems were enabled.

Within a week, the satellite had stopped tumbling and the 3-axis stabilization system was on line. On April 28th, a 10-meter resolution panchromatic image was taken over Texas and downloaded to Surrey for evaluation. The image showed good detail. Some adjustments were made, and a second image was taken over London, with excellent detail showing freeways and housing areas.

U-O-36 weighs nearly 700 pounds. It was built by Surrey Satellite Technologies, Ltd., to validate various small satellite bus structures and payloads. It carries equipment for multispectral and panchromatic Earth imaging, in addition to amateur digital communications systems on VHF, UHF, and microwave frequencies.

The primary digital downlink frequency is 437.400 MHz. U-O-36 operates in a similar fashion to the other high-speed digisats, with a 9600-baud output and input. However, in late May Peter Guelzow DB2OS reported excellent copy on the 38400-baud output frequency (437.025 MHz). This high-speed channel is usually activated simultaneously with the primary downlink, and is usually only on when the satellite is in view of Surrey. Over time, this may change, as the higher data rate gains more acceptance in the amateur satellite community.

U-O-36 can also operate at 76800 baud. Most current ham gear is set to work at a maximum rate of 9600 baud. Special receivers are needed that can handle the wider bandwidth of the higher data rates, or serious modifications are required on existing radios to achieve the same results. Peter reported that he was using a modified G3RUH modem set for 38400 baud and a Symek TRX4S high-speed data transceiver with a 110 kHz filter. This filter performs very well at 38400 baud, but can also perform up to 78600 baud.

In order to operate at faster rates such as 153600 baud, a wider filter (300 kHz) must be employed. Peter also made modifications to his TNC (Terminal Node Controller) to allow for transmission at 9600 baud with simultaneous receive at 38400 baud. Information about the TRX4S can be found on the Internet at: [http://symek.com/tnc-g/trx4s-ds.htm].

U-O-36 promises to be an exciting addition to the hamsat fleet. In addition to the imaging and message forwarding experiments, the satellite has devices for GPS (Global Positioning System) orbit and attitude determination, cold-gas orbit and attitude control, nitrous oxide resistojet orbit control, star imagers, reaction wheels, and even an Ethernet LAN (Local Area Network). More information about U-O-36 and SSTL can be found at: [http://www.sstl.co.uk].

Number 47 on your Feedback card

HOMING IN

Radio Direction Finding

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[http://www.homingin.com]

Four centuries of foxhunting

"The pursuit of the uneatable by the unspeakable!" That's how Oscar Wilde is said to have described foxhunting. Of course, he wasn't referring to the kind of foxhunting that hams do. But why was he so incensed?

Hunting animals for sport has gone on for centuries. In 17th-century England, stags, boars, and hares were the preferred quarry. But widespread tree-cutting for fuel and shipbuilding had destroyed woodlands and decimated the deer population. After the king decreed in 1670 that hunting of the "endangered" stag could be done only by his personal invitation, the Duke of Buckingham started the sport of foxhunting.

In those days, foxes were considered to be vermin in the Midlands area north of London. They sometimes attacked little lambs. So sportsmen decided to chase them. "Chase" is the operative word here, as the gentry horsemen in a field of foxhunters left the actual hunting to a pack of about four dozen dogs. English foxhounds were specially bred for speed and trained to hunt by a lower-class servant called the huntsman.

Traditionally, each year's foxhunting season began on the first Monday of November and continued through the end of the year. In the early morning of a hunt day, while these nocturnal animals were out foraging, servants stomped closed all the foxholes in the hunt area. Unable to find safety in their dens, the foxes sought cover in thickets.

A little before noon, after a gala lawn breakfast, all the gentry horsemen would gather at one end of a thicket. The huntsman sent his hounds into the other end to flush out the foxes. "Tally ho!" was the cry as the first hapless fox appeared, whereupon the hounds would track it down and eventually devour it for lunch.

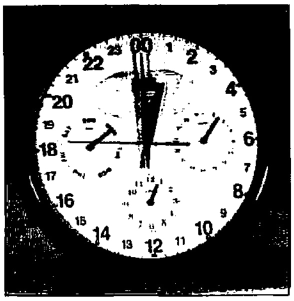
What about the mounted sportsmen? In truth, all they did was chase after the hounds, galloping gleefully cross-country, trampling fields and splashing through rivers. If they could stop the ravenous hounds in time, each rider ended up with a fox head, paw, or tail for his mantel.

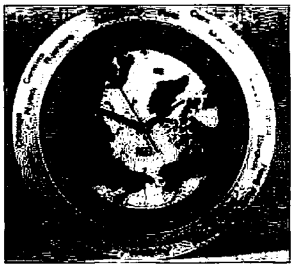
Foxhunting didn't really reduce the vermin population in England, because it became so popular that more foxes were imported just to have plenty of animals for the hunt. By the middle of the 18th century, it was the favorite activity of sportsmen. Gentry English emigrating to the New World sometimes sent their hounds ahead so that they could enjoy the sport here. George Washington was passionate about the sport, having been introduced to it when Lord Fairfax hired him as a teenager to survey portions of the

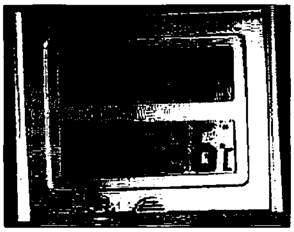
Continued on page 50

Number 48 on your Feedback card

New Products







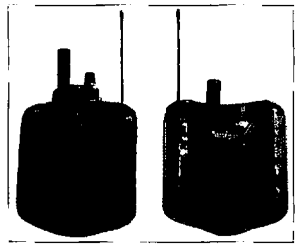
MFJ Mini News

• The MFJ-125 DXer's Dream 24-hour quartz wall clock has an attractive 12-inch-diameter face that shows 24H and 12H time, day of week, and day of month simultaneously. Uses single AA battery, as does World Map below. $29.95.

• Their World Map 24-hour quartz wall clock (MFJ-115) shows what time it is in designated cities of the world at any time of day. Each time zone has (+) or (-) from GMT. $24.95.

• MFJ's Model 120 is a precision radio controlled atomic clock with monster 2-inch LCD display. It features 24H/12H selectable, indoor temperature, and humidity simultaneously. Calibrates to within one billionth of second, and uses one AAA battery. $69.95.

For further information about these or other MFJ products, contact MFJ Enterprises, P.O. Box 494, Mississippi State MS 39762; tel. (800)-647-8324; E-mail [mfj@mfjenterprises.com]; site [www.mfjenterprises.com].



New Millennium Pocket Protector

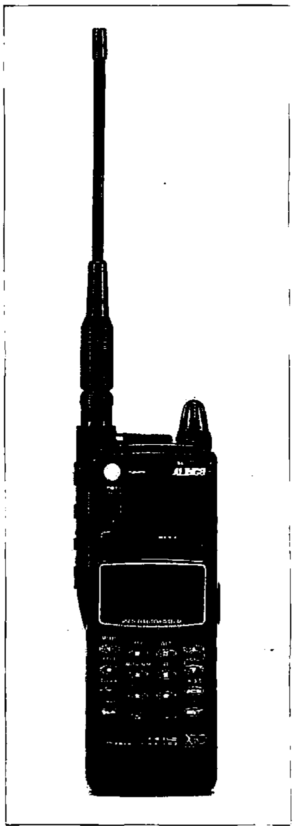
Cutting Edge's PowerPort PocketPRO™ puts a new face on the old notion of the plastic pocket protector. This great little leather pouch holds your mini radio along with a spare antenna and a few pens (for looks) up in your shirt pocket. A snug fit keeps the radio in place when you bend over. Made of soft, glove-quality leather, these handy holders are stylish as well as functional. For more info, write to Cutting Edge Enterprises at 1803 Mission St., Suite 546, Santa Cruz CA 95060; tel. (800) 206-0115; E-mail [cee@cruzio.com].

New HAMCALC — Free!

HAMCALC, used worldwide as a reference and learning tool since its inception in 1993, contains more than 200 painless math and design programs for radio amateurs and professionals. New HAMCALC v.38 is written in GWBASIC and requires a GWBASIC.exe file in your root directory. For a free 3-1/2-inch 1.44 Mb MSDOS/Windows diskette via airmail, send US$5 ($6 if you want GWBASIC.exe included) to George Murphy VE3ERP, 77 McKenzie St., Orillia ON L3V 6A6, Canada. Check or money order, no stamps or IRCS, please.

Chinese Army (PLA) Keys

Morse Express, a division of Milestone Technologies, has obtained a supply of surplus People's Liberation Army keys. The heavy, chrome-base Model K4/D117 keys weigh 2-1/2 pounds each. Because conditions vary, these are offered "pot luck" at $65 each, or at $75 each for a special "pick." The Model K7 light training keys feature a wooden base with chromed mechanical parts and weigh in at half a pound. These are in brand-new condition, for $26.50 each. Further information is available at [www.MorseX.com] or by calling (303) 753-3382.



Wide Range Receiver from Alinco

Have you seen it yet? Alinco USA's new DJ-X10T, we mean: a multimode, 1200-channel receiver, capable of tuning from 100 kHz to 2 GHz. It offers three-line alphanumeric memory channel labeling, Channel Scope™ spectrum activity display, two VFOs, selectable user configurations—and lots more!

The DJ-X10T can receive virtually any mode (wide FM, narrow FM, AM, SW, lower and upper sideband); the 1200 memory channels can be arranged in 30 banks of 40 channels each, will automatically transfer frequencies from VFO to memory, and each memory can store up to three lines of text describing the channel's contents. The user can configure the DJ-X10T in "New User" or "Expert" operating mode, and an internal "Help" will answer questions about functions and features.

The DJ-X10T has provisions for external power (it operates on a standard rechargeable NiCd battery pack), external speaker or earphone, and the antenna is a standard BNC connection. Additional features include an auto timer on/off, clock, backlit display and keys, low-battery alarm, and a whole lot more, for a suggested retail price of only $559.95—but your dealer may set a lower price for you, so ask about the Alinco DJ-X10T now! Alinco, 438 Amapola Ave., Ste. 130, Torrance CA 90501; (310) 618-8616.

continued from page 47

five million acres that Fairfax had inherited in northern Virginia.

Foxhunting is a relic of days when there was no compulsory education and a choking yellow smog blanketed London from coal stoves in homes. Things are better now, right?

Oops, wrong kind of fox!

Bushy-tailed animals have nothing to fear from ham operators on foxhunts, although the hams sometimes look just as silly as foxhounds when they scurry about trying to find hidden radio transmitters. Nevertheless, it's hard to imagine why ham operators gave the name of an inhumane pastime of the 18th and 19th century to an exciting and educational radio sport.

Instead of the sense of smell, today's ham radio foxhunters are using radio direction finding (RDF) equipment, of course. I think that the history of RDF is even more interesting than that of English foxhunting. In "Homing In" last September, I explained how Marconi, Bellini, Tosi, and others pioneered RDF about 80 years ago.

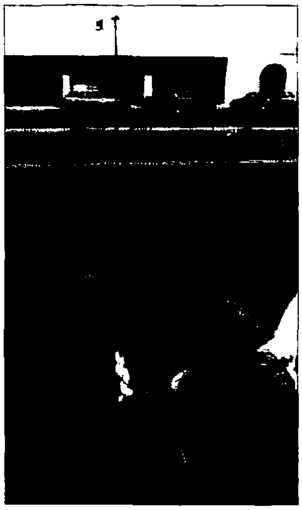


Photo A. Classic military RDF antennas like this one from the Korean War era are plentiful and inexpensive at flea markets. They are a great way to get started in transmitter hunting on the 6-meter band.

From plotting the movements of World War I ships to tracking down stolen BMWs, radio direction finding technology has come a long way in eight decades. A lot of interesting things have happened in between, as readers of the September column were quick to point out. Several hams at my local radio clubs passed along their remembrances of early RDF equipment and their experiences with it.

Mike Obermeier KD6SNE reminded me about "White Heat," a motion picture classic from 1949. A team of gangsters led by James Cagney is tracked by RDF after an officer infiltrates the gang and constructs an emergency beacon transmitter out of a radio receiver. FCC agents with rotating loop antennas on their sedans relay their bearings to headquarters, where they are triangulated on a giant map of the Los Angeles basin. Will they find the beaconing tanker truck in time to stop the payroll robbery? It's great fun to watch and to imagine what these postwar-era G-men would think about APRS.

Among the letter writers was Pete Hardiman N7DUC of Hillsboro, Oregon. His story was a reminder that RDF was saving lives long before ELTs on aircraft became common. "I enlisted in Canada in 1941," Pete writes. "I flew over a hundred missions over enemy territory in Canadian DeHavilland Mosquito aircraft before transferring to the US Army Air Force in late 1943. Then I flew fighters as a bomber escort until the end of the war. The bases in England often used the Marconi RDF system with goniometers to guide aircraft home in dark or bad weather.

"One night in 1943," N7DUC continues, "my navigator and I were in a Mosquito over central Germany heading 270 degrees (westbound) after a mission. We heard a distress call from a British Halifax bomber damaged by flak that had destroyed their liquid compass and radio compass control box. Their aircraft HF antennas were not working either, so the radio operator was using the trailing antenna, about 75 feet long, hanging below.

"We got them to call several times over a five minute period so we could take RDF bearings, and we determined that they were flying northbound somewhere behind us. We got them to turn left and verified that they were then traveling our way. We slowed our own progress to increase their signal strength and asked them to look below for points on the ground. Soon we had them located about 125 miles behind us. They continued to call and pinpoint the ground for navigation.

"When they reached the enemy coastline, we were taken over by ground radar, so they reached their home base that night safely. My navigator and I were invited to visit the Halifax crew and received a special citation for saving their lives. Not being able to determine which direction they were flying or their position, they were helpless. But we could not have done anything for them without RDF."

Caught by kilocycle kops

The decade of the 1950s was the golden era of FCC enforcement. In those days of ample budgets, government monitoring stations cruised the bands, nipping trouble in the bud. Nothing was more feared by a ham than a personal visit from these "Kilocycle Kops," as one writer of the day called them. Every FCC Field Office employee had interesting stories to tell. One of the best is the story about the bogus satellite, which was passed along to me by Larry Guy K6EZM, former Engineer-in-Charge of the LA FCC.

When *Sputnik I* was launched on October 4, 1957, FCC monitoring station engineers were instantly bombarded with requests for information about its radio transmissions. During its 21 days of transmitting, and the week of transmissions from *Sputnik II* in the following month, hundreds of man-hours were spent analyzing the first man-made signals from space. Officials from many government agencies wanted to know all they could about the bird before the frequency went silent.

Imagine everyone's surprise when *Sputnik*'s frequency came alive again in mid-December. The familiar beep-beep lasted only twenty seconds or so at a time but was there regularly, once every hour. Listeners in several countries heard the signal, but the Soviets firmly said they had not launched another satellite. What was going on?

FCC engineers soon determined that the signal was not from *Sputnik I* or *II* having come back to life. Whereas the satellites had been on both 20 and 40 MHz, this signal could only be detected at the lower frequency. Furthermore, all listeners worldwide heard it at the same time, not spaced out over an orbital period.

RDF installations at the monitoring stations triangulated the signal to the mountains north of Los Angeles. Now it was up to the field engineers to find its exact source. There was no time to lose, for continued presence of this mystery signal could have international implications.

Mobile units determined that the source was not close to any road. An on-foot setup for RDF at 20 MHz did not exist and had to be devised. It was quickly put together using a tube-type general coverage receiver, vibrator power supply, and a six-volt car battery, all mounted on a military-type stretcher for a two-man carry. Both a loop antenna (similar to **Photo A**) and a ferrite loaded dipole were used at various times to get lines of bearing.

Remember that the signal was on for only twenty seconds out of each hour. Combine that with the mountainous terrain and the problem of occasional erroneous bearings from skywave paths (this was the peak of the sunspot cycle), and you have a truly grueling

Number 51 on your Feedback card

ON THE GO

Mobile, Portable and Emergency Operation

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Is the Y2K bug a significant problem, or is it just something everyone has blown out of proportion? I heard a great comment on the news the other day that put it into perspective. One individual, when asked about the Y2K problem, compared it to an earthquake. He proposed that we knew for certain that there would be an earthquake on a given day at a particular location. This earthquake could be anywhere from a 1 to a 10 on the Richter scale, so there might be no damage or perhaps massive destruction, but regardless of the severity we knew for certain that it would occur and when. Would we prepare for this? Of course. This, he said, is like the Y2K bug. There may be great or small problems on the first of January 2000, but knowing that it will occur means that it is in our best interest to prepare. I think this is a great philosophy.

Last month, I addressed some of the ideas for preparing for problems we might face next January. For the most part, I was thinking that we might face many of the same problems that we encounter during bad weather disasters: loss of power, loss of traffic signals, etc. I think there is one major difference that we might face when dealing with Y2K: Some people, in their zeal to prepare, might add to the very problem they are trying to avoid.

People may not be completely familiar with some of the equipment or supplies they are purchasing. Let's look at some of the possibilities.

Generators: How many generator owners know how their generators should be used? Aged gasoline that has sat in the tank for an extended period may make a generator difficult or impossible to start. Operating generators need to be located in a vented area—preferably out-of-doors—to allow the exhaust to escape. Failure to locate a generator properly could result in carbon monoxide poisoning.

Fueling a generator may also present problems. It would seem to be prudent to shut the generator down and allow it to cool prior to fueling. It is highly likely that not everyone will do so, especially if they are attempting to fuel the generator after dark, so the threat of fire may increase. Finally, somebody somewhere will decide to plug their generator into their house to allow the house lights to be used. It is unlikely that this individual will completely disconnect his house from the power grid. This will have a number of unexpected results, including a risk to the utility company workers. It will probably prove very interesting when the power comes back on.

Heaters: In the colder climes, people may lose heat. If electrical power is lost, not only will those with electric heat have problems, but also those who have fossil fuel furnaces that require a blower. Finally, I can't help wonder how many of the popular digital thermostats have embedded chips that might fail. People without heat will be forced to try alternative measures. Many homes have fireplaces, although they generally are used more because of their aesthetics than for practical heating. People using wood burning fireplaces regularly know that there is a bit of an art to starting a fire in order to ensure that the smoke draws up the chimney. Chimneys need to be kept clean and clear, but many people neglect to do so. A blocked chimney (or forgetting to open the flue) can result in a house filled with smoke. The tars that build up in a dirty chimney are flammable, and chimney fires can occur. Finally, some may try to use inappropriate fuel such as charcoal or kerosene (or worse), which may present an increased risk of fumes, carbon monoxide poisoning, or fire.

Telephones: Phones work differently (if they work at all) in a crisis. Even if all of the circuits are Y2K compliant, a significant increase in utilization will have an effect (ever have problems getting through to Mom on Mother's Day?). As everyone picks up their telephone to verify that friends and relatives are okay, the system becomes overloaded. Think about any circuit that normally has only a small number of devices drawing current. As you add more devices, naturally the current will drop, until the current falls below the level required to operate them properly. Of course, when the landline system fails, everyone immediately grabs their cellular telephone and guess what happens next?

Weapons: Yep, some people somewhere in the attempt to defend themselves from evils real (or imagined) will put a bullet through their foot, wall, neighbor, etc. Then there is the potential for some increase in crime. Some people have concerns about the banking industry's computers, automated teller machines, etc. After a satellite glitch shut down many credit card operations last year, this concern has some basis in fact. The government has announced that they

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hunt. One field engineer caught a severe fever that kept him off the job for several weeks. But the FCC didn't give up.

Shortly before Christmas, engineers Harry Barnard and George Dillon finally tracked down the pseudo-*Sputnik*. It was in an old hollow tree, its wire antenna threading up through the branches. The one-tube transmitter got power from a vibrator supply that was keyed by an automobile clock. Every hour, the minute hand brushed a stationary contact, started the supply, warmed up the tube, transmitted for a few seconds, and then shut down.

Finding this gizmo was only half the battle. Now the government higher-ups wanted to know where it came from. Was it a harmless prank or something more sinister? Taking no chances, FCC called in Marine demolition experts to make certain that the device was not booby-trapped. It wasn't, and soon the contents could be examined. Nothing about the transmitter, supply, or antenna was unusual or distinguishing, except the crystal.

A check with the crystal manufacturer showed that only two of its kind had ever been made, both on a special order for one of southern California's aerospace firms. The company's management was cooperative, and eventually two young engineers confessed. Their "harmless" prank cost each one a $1000 fine and a year's suspension of his ham radio license.

Imagine carting a setup like that on your next sniffer hunt! Hidden transmitter hunting today may be just as challenging and frustrating, but it isn't nearly as arduous. Today's on-foot RDF gear is small and light enough for a child (yours?) to carry. Radio foxhunting for sport is fun for the whole family, so give it a try. For more information on RDF and foxhunting, visit the Homing In site on the World Wide Web, [http://www.homingin.com].

Number 52 on your Feedback card

THE DIGITAL PORT

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My non-ham wife detected excitement in my voice as I called her into the shack and showed her the new mode on the screen. For those of us who look at a screen with a new program in progress, the equipment takes on a personality of its own. Being the understanding ham's wife, Janet stretched for a bit of enthusiasm and said something like, "That's wonderful!" Then she retreated carefully back to her bailiwick.

If the truth should be known, these Windows programs all resemble each other because there are buttons to click in all about the same places and there is a body part of the screen. That body part may as well be a word processor for the uninitiated.

Except that this was different. ... I was looking at the first PSK31 signal I had copied after installing the program and getting organized. The really unique part of copying this particular signal was that the audible tone was nearly nonexistent and, of course, that being the case, the S-meter was not moving! And ... it was nearly perfect copy. That stuff that resembles the working part of a word processor was appearing, as if by magic, from nowhere!

A brand new mode has arrived This was PSK31 doing what it does best, getting through, intelligibly, with very low signal strength, and using an absolute minimum of spectrum. I mentioned this mode and the Web address for download last month. (See chart.)

I didn't get (make) time to give it a try until nearly a month later. When you get the program, you are well advised to print and read the documentation. Although the setup is simple and straightforward, you must follow the instructions.

Fortunately, my desktop has a 16-bit sound card, which is specified. They do not sound fussy about what brand of sound card and they allude to versions of the program that will work with "other DSP development kits." I apparently have the "accepted" sound card, because the program worked great once I got my act together.

These sound card programs are not new to this column but, by way of review, they are doing a super job in that you can run them without a terminal node controller (TNC) or even a simple serial modem. I have a serial modem I made a year or so ago that, with the proper software, will work SSTV and RTTY. And I have my old-faithful hardware-based AEA PK232-MBX that performs well with less intense software applications.

The first sound card program I used was from Silicon Pixels. They produce excellent software for SSTV that is available for download from their Web site. (See chart.) This software provided my first adventure with using the sound card to interface directly to the radio.

I mentioned last month that if you had done as I, and made up your cables to use your sound card for SSTV, you were ready to hook up for PSK31. I looked at my setup for the ChromaPix programs and decided I would make up a new, improved set of cables that would meet the specs for the new mode and be just a shade neater.

Besides, I wanted a portable set to hook up the laptop. Another part of the story will unfold in a few paragraphs concerning what happens when you stray from home base. The important part I want to get across is how they stress using what ICOM (my little 735) refers to as the accessory connector and not using the microphone connector or speaker jack to get sound to and from the sound card.

You are warned not to use the microphone input or the speaker output, to avoid overdriving and spoiling the effect of the mode. If you overdrive your radio, they claim the narrow bandwidth spreads right out and/or the signal becomes unintelligible. Also, you are told not to use your speech processor, as it will overdrive the signal.

Once I got the new cables in place and performed the initial setup of the program, I started listening. I couldn't hear signals. I tuned in the general area where you hear RTTY and PACTOR and heard plenty of those signals (14.072–14.088 MHz). I called CQ, with no response.

I tuned a little below 14.070 and heard the PACTOR bulletin boards. Then, for some reason I can't explain, I persisted in tuning that area while I kept an eye on the novel tuning indicator included with the program.

A novel tuning indicator it is. I would have made a screen shot of the program in action, but the tuning system would be so infinitesimally small it wouldn't make sense in print. It consists of a small circle with variable patterns that not only change shape and dimension but, when a decoded signal is in the process, it changes color!

That was when the excitement that I described at the beginning of the article struck me so vividly. The funny little shapes I was watching changed from red to a greenish yellow. Whoa, I thought, this is mentioned in the documentation. I covered the eye that was watching the yellow crawly pattern and focused the other on the body text and there, from out of

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are increasing the printing of currency because it is expected that so many people will want to have cash on hand.

Naturally, these emergencies will be in addition to those that occur every day and those caused by people celebrating a special New Year's Eve. So there may be some interesting challenges to be faced (or maybe not). However, it is better to prepare and not need to react than to not prepare. Incidentally, in early April there were a number of tests performed by power companies in preparation for January 1. No, they did not test the generators or the power grid. Instead, they tested their communications backup systems in case the regular communications systems, such as telephones, fail. They relied on their own radios, with overflow going to pay telephones and cellular phones. The news stories report that everything went well, but once again this may or may not be indicative of how it will go in January. The utility companies will be competing for the same phone lines or cellular frequencies as many others if there are problems.

As communicators we are often called upon to provide the links between different organizations in emergency situations. If Y2K does create power problems, much of what we may be called upon to do will be similar to what we have done in other disaster operations. The biggest difference is that this time we have plenty of warning. It would be wise to take advantage of the time we have to prepare intelligently.

Well, I'd like to add more, but I think I'm going to go check my battery supply—just in case.

nowhere, was someone's transmitted message forming before my unbelieving eyeball!

You will find, as I did, that you must tune slowly (make that s-l-o-w-l-y) in order not to miss the 31-Hz-width signal. That is less than 2% of the width of an SSB signal! Someone suggested using the RIT to fine adjust for receiving. I did that, but I would only advise doing so if you are either in contact with a station or are just reading someone's mail. The problem is that you will transmit far away from the frequency the other station will be monitoring if you should give him a call.

I found that it was hard to be noticed as I attempted to call CQ or answer other weak-signal calls. I recalled the advice about overdriving, and went back through the setup process to check that I was following the rules. All seemed to be okay.

Then I went back to the listen mode, and a louder signal was calling CQ—it moved the S-meter vigorously. I gave a call, and surprise! I made my first PSK31 contact. I would like to give Bill down in Alabama proper recognition, but I forgot his call and am away from home at this writing. We were both giving signal reports of S5 to S9 over a period in excess of a half-hour.

Bill has been doing digital modes for a long time. Sometimes, it is nearly unbelievable when someone tells me the last time we made contact was seven years ago and it was on AMTOR. There's a guy who efficiently and persistently keeps his digital logbook up to date.

We conversed, of course, primarily about the new mode. He brought a part of the tuning indicator to my attention that is especially relevant. I had noticed what I referred to as the waterfall. That is below the circle I mentioned.

The waterfall tells you if you are exactly tuned to the signal you are receiving. It is a spectrum analyzer. It also allows you to fine tune the signal with your mouse on the screen. Plus, it gives an idea of the width of the signal and lets you see if there are adjacent signals. The spectrum it samples is about 250 Hz wide, still pretty darn narrow.

Bill tells me he has observed as many as four QSOs in progress within the breadth of the waterfall spectrum analyzer, and they were not conflicting with each other. Try that with any other mode. I have worked CW with good filtering amid a lot of signals, but once the filter was out of the picture, there was nothing intelligible. PSK31 is one giant leap forward, I must say.

As I mentioned, I am writing this while away from home. I was sure this would be a time when I could put this mode to the test with this laptop. (It always performs flawlessly.) Murphy's Law followed me again.

Before I left the house, I copied the program to disk. When I went to copy the files to the laptop from the disk, the disk corrupted. End of that portion of the experiment for a time. I shouldn't blame the computer. I think it had to do with the zipped file and I was trying to extract it from the floppy to the hard drive. Of course, you and I know that would not have happened at home where another copy could have been made.

Other software becoming available that will be a help to those who are in need of choices for their TNC will be reported on next month.

I received a message from Rick Ruhl, who heads a software group by the name of Creative Services Software. Rick explained they have software

Current Web Addresses	
Source for:	**Web address (URL)**
HF serial modem plans + software	http://www.accessone.com/~tmayhan/index.htm
SV2AGW free Win95 programs	http://www.forthnet.gr/sv2agw/
BayCom — German site	http://www.baycom.de/
Pasokon SSTV programs & hardware	http://www.uitranet.com/~sstv/lite.html
New Mode — PSK31 — Free download	http://aintel.bi.ehu.es/psk31.htmi
Baycom 1.5 and Manual.zip in English	http://www.cs.wvu.edu/~acm/gopher/Software /baycom/
Source for BayPac BP-2M	http://www.tigertronics.com/
TNC to radio wiring help	http://prairie.lakes.com/~medcalf/ztx/wire/
ChromaPIX & DSP software	http://www.siliconpixels.com/
Timewave DSP & AEA products	http://www.timewave.com
International Visual Communication Association — a non-profit organization dedicated to SSTV	http://www.mindspring.com/~sstv/
XPWare — TNC software with sample download	http://www.goodnet.com/~gjohnson/
Auto tuner and other kits	http://www.ldgelectronics.com
TAPR — lots of info	www.tapr.org
Creative Services Software	www.cssincorp.com

Table 1. Handy URLs.

Number 54 on your Feedback card

Calendar

Listings are free of charge as space permits. Please send us your Calendar item two months in advance of the issue you want it to appear in. For example, if you want it to appear in the November issue, we should receive it by August 31. Provide a clear, concise summary of the essential details about your Calendar item.

JULY 17

LOVELAND, CO Superfest99 will be hosted by the Northern Colorado ARC, 8 a.m.–2 p.m. at the Larimer County Fairgrounds, 700 Railroad Ave. Commercial exhibits, computer and radio goodies, and more. Reserve tables from *Michael Robinson N7MR, (970) 225-7501*. General info: *(970) 352-5304*. Talk-in on 145.115(-) 100 Hz.

WELLINGTON, OH The Northern Ohio ARS will sponsor NOARS-FEST 99, Sat., July 17th, at Lorain County Fairgrounds in Wellington OH. There is a huge outdoor flea market area, ample indoor commercial space, reservations required. Indoor 8-ft. tables $15 each. All workers require an admission ticket. No tickets included with tables. $5 per 8-ft. space in flea market area. Admission tickets $5 at the gate. Children under 12 admitted free. Overnight parking for RVs and campers. No hookups. Walk-in VE exams with registration 8 a.m.–9 a.m. Exams start at 9 a.m. NODXA DXCC card checking (cards in by 11 a.m.). Contact *John Schaaf KC8AOX, (216) 696-5709, E-mail [kc8aox@qsl.net]*; or write to *NOARSfest, P.O. Box 432, Elyria OH 44036-0432.*

JULY 18

CAMBRIDGE, MA A tailgate Electronics, Computer, and Amateur Radio Flea Market will be held Sun., July 18th, 9 a.m.–2 p.m. at Albany and Main Sts. in Cambridge. Admission $4. Free off-street parking. Fully handicapped accessible. Sellers $10 per space at the gate, $9 in advance—includes 1 admission. Setup is at 7 a.m. For space reservations or further info call (617) 253-3776. Mail advance reservations before July 5th to *W1GSL, P.O. Box 397082 MIT BR., Cambridge MA 02139-7082.* This event will be held rain or shine. Covered tailgate area available for all sellers. Talk-in on 146.52 and 449.725/444.725 PL 2A, W1XM rptr. Sponsored by the MIT Radio Society and the Harvard Wireless Club.

SUGAR GROVE, IL The Fox River Radio League will hold their Annual Hamfest at Waubonsee Community College, Rte. 47 at Harter Rd., Sugar Grove IL (5 miles NW of Aurora). Doors open Sun. at 8 a.m. with setup Sat. at 7 p.m., and Sun., 6 a.m.–8 a.m. VE exams at 10 a.m. Bring original license, copy of license, and photo ID. Talk-in on 147.210(+) PL 103.5/107.2. Contact *James Von Olnhausen N9UZC, c/o FRRL, P.O. Box 673, Batavia IL 60510. Tel. (630) 879-3042; or E-mail to [n9uzc@amsat.org]*. The Web site is at *[http://www.frrl.org/hamfest.html]*. The Fox River Radio League is celebrating 75 continuous years as an amateur radio club. There will be special anniversary promotions at the hamfest.

VAN WERT, OH The Van Wert Ohio ARC's 12th Annual Van Wert Hamfest will be held at Van Wert County Fairgrounds, US Rte. 127 South, 8 a.m.–3 p.m. Radios, computers, software, electronic parts, new and used. Indoor tables and outdoor trunk sales. Free parking. Overnight $10. Tickets $5. Talk-in on 146.85(-). For table reservations, send an SASE with your name and address to *Van*

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for the AEA/Timewave line and Kantronics. I mentioned that I had had a few calls for aftermarket software for the MFJ multimode units. His company will have them out before this hits print. He also mentioned software for PacComm equipment. They have a Web site with demos and further information, and I have downloaded the demo. The URL is included in this month's chart.

The behinder I get

Last month, I mentioned the availability of a DSP program from Silicon Pixels that runs on the sound card. I have it. I still have to give it a try and will tell you about it. It is another one of those exciting things that is happening in ham radio that keeps propelling the technology forward. And I expect it to work well because of good experiences with the DSP written into their SSTV program. This program, mind you, is not about SSTV, but other modes. I don't recall at the moment if it is for other than sideband, but I will find out and tell you.

What would the ham shack be like without a computer and sound card? And just think ... Some of these very fancy things being developed by hams will eventually find uses that will change the world for non-hams, probably my wife included (little smile there).

Short Y2K discussion

There is a lot of rhetoric about the demise of humanity come the end of 1999 because of the date problem in computers. I can't find anything really definitive about the truthfulness of all this and don't wish to get in the middle of heated exchanges on the subject. We do keep extra food and heating fuel and have a small generator because we live where winter can take its toll on transportation and power lines.

A few years back, a flood disrupted the natural gas service for a period of several days. It was good to have something to fall back on while we were being "taken care of" by the utility company that we take for granted.

All that aside, there is the problem with my aging desktop and this fairly young laptop. I see plenty of "fixes" available. Some free, some pricey. I am not sure what to recommend and should be careful, but I picked one from a fairly large company, Parsons Technology, that was reasonably priced. It came for a little over $20.

Installation of the small program was quick and simple. It claimed to have made a few fixes and would have to wait until the witching hour at the beginning of the year 2000 to see what else it could do, and explained that I should go on with life until that day.

There was no mention of need for a lead-lined suit when booting the computer on that fateful day. Interestingly, there is a DOS message that appears each day, on boot-up, that says there is no need to make any changes concerning Y2K at this time.

Not being a self-proclaimed expert on this subject, I cannot tell you positively that I have found the solution to my Y2K problems with this program. However, since the only date specific actions have to do with saving files and a few automatic date insertions, I will have to wait and see.

Worst case may be changing motherboards and software. Simplest repair may be simply to set the computer clock back a few years *[or to 1972, which mirrors the year 2000 — ed.]* until I can afford to really fix the problem. We shall see.

Please send questions or comments to [jheller@sierra.net]. I will share what I know or find a resource for you. For now, 73, Jack KB7NO.

Wert ARC, P.O. Box 602, Van Wert OH 45891-0602; Tel. (419) 238-1877; or E-mail Bob WD8LPY at [barnesrl@bright.net]; Web site is [http://www.bright.net/barnesrl/w8fy.html]. 8-ft. tables $10 each (includes one free ticket). Trunk sales: 12-ft. x 1-ft. area, $5 plus ticket. VE exams: Must pre-register by July 11th. Contact *Bob High KA8IAF, 12838 Tomlinson Rd., Rockford OH 45882. Tel. (419) 795-5763.*

JULY 23–24

OKLAHOMA CITY, OK The Central Oklahoma Radio Amateurs will sponsor their 26th annual "Ham Holiday '99" at the Oklahoma State Fair Park (Hobbies, Arts & Crafts Building), northeast of the I-40 & I-44 intersection. Doors open 5 p.m.–8 p.m. Fri., July 23rd, and 8 a.m.–5 p.m. Sat., July 24th. Technical and nontechnical programs. Fox hunt, WAS card check, VE exams, flea market. Pre-registration $7, $9 at the door. Flea market tables $10 in advance, $15 at the door, if available. Electrical hookup $5. Talk-in on 146.82. Additional info and registration forms are available on the CORA Web site at *[www.geocities.com/heartland/7332]*. Address other inquiries to *Ham Holiday '99, P.O. Box 850551, Yukon OK 73085-0551; or E-mail [n1lpn@swbell.net].*

JULY 24

CINCINNATI, OH A hamfest will be held by the OH-KY-IN ARS at Diamond Oaks Career Development Campus, 6375 Harrison Ave., beginning at 7 a.m. July 24th. Take I-74 to the Rybolt and Harrison Ave. Exit. Go east on Harrison Ave. The hamfest is on the right-hand side (south side) of Harrison, less than one mile from the I-74 exit. Special seminars to develop technical understanding in amateur radio, and a transmitter hunt at noon, are among the events to be featured. The first two flea market spaces are free with admission, additional spaces @ $3 each. Admission $4 in advance, $5 at the door, 12 and under free. Indoor vendor tables with electricity, $8. VE exams. Talk-in on 146.67. Contact *Dana Laurie WA8M, 280 Hillcrest Dr., Cincinnati OH 45215-2610. Tel. (513) 761-7388; E-mail [wa8m@arrl.net].*

AUG 1

CROOKED LAKE, ANGOLA, IN The Annual Land of Lakes Hamfest will be held at Steuben County 4-H Fairgrounds, Corner of 200 W. and 200 N., exit 150 off of I-69. Doors open 7 a.m.–2 p.m. Free parking. VE exams. Tickets, $3 in advance, $4 at the gate. Vendors setup Sat., July 31st, 3 p.m.–10 p.m.; Sun., Aug. 1st, 4 a.m.–7 a.m. Indoor tables $8. Trunk sales $2. Talk-in on 147.180 PL 131.8. *E-mail [sharon.1.brown@gte.net]*, or call *(219) 475-5897.* Sponsored by the Land of Lakes ARC.

AUG 7

ALFARATA, PA The JVARC Hamfest and Antique Radio Swap Meet will be sponsored by the Juniata Valley ARC (Lewistown PA) and the Decatur Township Fire Company, at the Decatur Township Fire Co. Grounds, 8 miles east of Lewistown PA, on US 522 North. The event starts at 8 a.m. Setup at 7 a.m. Admission $1 donation, XYL and kids free. Tailgating $5 donation. Talk-in on 146.910. For info call *Richard Yingling WB3COB at (717) 242-1882.*

AUG 8

GREENTOWN, IN The Kokomo and Grant County ARCs will host the Greentown Indiana Hamfest at the Greentown Lions Club Fairgrounds, beginning at 8 a.m. EST. Setup at 6 a.m. EST. Talk-in on 147.240(+). Contact *L. B. Nickerson KA6NQW, 517 North Hendricks Ave., Marion IN 46952. Tel. (765) 668-4814; E-mail [ka6nqwnick@netusa1.net];* or *Kevin Cornell K9LHB, 422 Goode Ave., Kokomo IN 46901, (765) 457-0454; E-mail [k9lhb@netdirect.net].* The **URL** is *[www.netusa1.net/~ka6nqwnick/hamfest.html].*

MARTINS FERRY, OH The Triple States ARC Hamfest/Swapfest will be held Sun., Aug. 8th, 8 a.m.–3 p.m. at Red Men's Picnic Grounds, Cty. Rd. 4, Martins Ferry OH. Large open free flea market space. Price of admission $2. Tables under cover with electric built-in. For info and directions, contact *TSRAC, 2011 State Hwy. 250, Adena OH 43901. Tel. (740) 546-3930; E-mail [k8an@aol.com].*

PEOTONE, IL The Hamfesters Radio Club of Evergreen Park IL will hold their 65th Annual Hamfest on Sun., Aug. 8th, at the Will County Fairgrounds (I-57 Exit 327 East) in Peotone. They are providing an air-conditioned, fully enclosed pavilion for this event. Free overnight parking. $20 per table. One ticket free per vendor. The flea market electricity fee is $10. All others, $4 in advance. $5 at the door. All tables reserved. All cash due at reservation. Your gate pass will be issued at arrival. Your ticket will be needed. Sat. unloading and setup 3 p.m.–11 p.m. only. Gate opens at 6 a.m. Sun. Main Exhibition Hall opens at 8 a.m. sharp. Send reservations and donations to *Tom Davis, 14914 Washtenaw, Harvey IL 60426. E-mail [tdavis@internetplus.net].*

AUG 15

CAMBRIDGE, MA The MIT Electronics Research Society, the MIT Radio Society and the Harvard Wireless Club will hold a Tailgate electronics, computer and amateur radio Flea Market Aug. 15th, 9 a.m.–2 p.m. at Albany and Main Sts. in Cambridge MA. Admission $4. Free off street parking. Fully handicapped accessible. Sellers $10 per space at the gate, $9 in advance—includes 1 admission; setup at 7 a.m. For space reservations or further info call *(617) 253-3776.* Mail advance reservations before Aug. 5th to *W1GSL, P.O. Box 397082 MIT BR., Cambridge MA 02139-7082.* A covered tailgate area is available for all sellers. Talk-in on 146.52 and 449.725/444.725 PL 2A, W1XM/R.

YORK, PA A Ham and Computer Swap Fest and Fun Auction will be held at York Vo Tech School, located at the intersection of I-83 and PA 74. For additional info, call *(717) 741-1780 or E-mail [ad3e@arrl.net].*

AUG 21

ITHACA, NY The Tompkins County ARC announces its 1st annual Finger Lakes HAM-IN (hamfest and fly-in) at Tompkins County Airport (KITH), 3 miles NE of Ithaca. Large hangar for indoor vendors and displays. Paved outdoor flea market and parking. Airplane rides and aviation displays. Breakfast and lunch served. Admission $5, under 18 free. Indoor tables $10; outdoor spaces $2 each. VE exams, pre-registration preferred. Talk-in on 146.97. Contact *Richard Spingarn, (607) 387-5251.*

LONGVIEW, WA The Lower Columbia ARA, W7DG, will sponsor its 8th Annual Ham Radio, Computer and Electronic Equip. Swap Meet 9 a.m.–1 p.m. at the Cowlitz Co. Expo Center in Longview. Admission $3. Tables $15. Tailgate spaces $5. Free parking, overnight RV parking on the fairgrounds for $12. Electrical hookup available. No VE exams. Vendor setup on Fri., 5 p.m.–9 p.m.; Sat., 6 a.m.–8:45 a.m. Talk-in on 147.26(+), PL 114.8. Take Exit 36 or 39 off Interstate 5 and follow the signs west for the Expo Center (or fairgrounds). Mt. St. Helens and the Oregon coast are nearby. For more info write to *LCARA Swap Meet, P.O. Box 906, Longview WA 98632;* or call *Bob KB7ADO at (360) 425-6076, in the evening. E-mail [kb7ado@aol.com].* Link to flyer online at *[www.qsl.net/nc7p/].*

AUG 22

ST. CHARLES, MO "Hamfest 1999" will be held by the St. Charles ARC, 6:30 a.m.–1 p.m. at Blanchette Park in St. Charles MO. Free admission. Ample free parking. Talk-in on 146.67. A parking lot flea market will be held for amateur radio and electronic items only. $10 per parking space. For vendors inside the air-conditioned Memorial Hall, tables are $15 each. Call for availability. Contact *Ken Fieser, (314) 428-4383; E-mail [kfieser@aol.com].*

AUG 28

GARDNER, MA The Mohawk ARC, Inc., will hold their 7th Annual Ham Radio, Electronics, Computer Hamfest at the Mohawk Drive-in Theater in Gardner, rain or shine. Spaces will be reserved for those who register in advance. Sellers' hours, 6 a.m.–3 p.m., $5 per space. Mail advance registration orders to *John Dould AE1B, 22 South Athol Rd., Athol MA 01331-2722.* General admission is 8 a.m.–3 p.m., $2 per person. Directions: Rte. 2 to Gardner, take

Exit 22, then Rte. 68 South to the first set of lights. Take a right at the lights onto Rte. 2A. Follow the airport signs for 1-1/2 miles. Entrance is on the left. Talk-in on 145.370 rptr.

LA PORTE, IN The La Porte ARC will host a hamfest Aug. 28th, 7 a.m.–2 p.m., at the La Porte County Fairgrounds IN, 2 miles west of La Porte. Admission $5 in advance, with this ad, or $6 at the gate. Tables $10 each. Outdoor tailgating is free. Talk-in on 146.52. Contact *Neil Straub WZ9N, P.O. Box 30, La Porte IN 46352. Tel. (219) 324-7525. E-mail [nstraub@netnitco.net]*. See their site on the Web at *[www.geocities.com/siliconvalley/byte/1653]*.

AUG 28–29

WOODLAND PARK, CO The Mountain ARC will hold a Camp/Swapfest Sat., Aug. 28th, and Sun., Aug. 29th, at the Colorado Lions Club Camp, 4 miles north of Woodland Park CO, on Hwy. 67 North. Free admission for buyers. $10 daily to camp and/or sell. Set up camp Fri., Aug. 27th, after 2 p.m. Talk-in on 146.820 rptr. Advanced reservations requested. Contact *Wes KØHPZ at (719) 687-8758; E-mail [wlw@prodigy.net]*; or mail reservations to *MARC, P.O. Box 1012, Woodland Park CO 80866.*

SPECIAL EVENTS, ETC.

JULY 18

STRATFORD, NY The Fulton County Dr. Mahlon Loomis Committee will operate W2ZZJ on July 18th to commemorate the 173rd anniversary of the birth of Dr. Loomis, the American radio pioneer who was born at Oppenheim NY on July 21st, 1826. Operation will be from 1300–2000 UTC on the General class phone portion of 75, 40, and 20 meters, and on the Novice 10 meter phone band. Also on area 2-meter FM repeaters. For a parchment certificate and extensive literature, send QSL, contact number, and a #10 SASE (55 cents) to *George P. Sadlon W2ZZJ, 5738 St. Hwy. 29A, Stratford NY 13470 USA.*

JULY 30–AUG 1

OSHKOSH, WI The Fox Cities ARC (Appleton WI) will operate W9ZL from the world's biggest fly-in, "EAA Airventure '99," at Wittman Regional Airport in Oshkosh WI. SSB and RTTY operation will be Fri., July 30th–Sun., Aug. 1st, in the General portions of the phone bands. Operators of the club will man the station from 9 a.m.–4 p.m. daily. A special 8" x 10" certificate is offered for contacts with proper QSLs. QSL to *Wayne Pennings WD9FLJ, 913 N. Mason, Appleton WI 54914 USA.*

JULY 31–AUG 1

OGDENSBURG, NY Ogdensburg ARC, K2RUK, will operate 1800Z July 31st–0200Z Aug. 1st, commemorating the 250th anniver- sary of the founding of the settle- ment of Ogdensburg. Operation will be on 7.272 and 14.272. For a certificate, send an SASE to *Walt Brady N2YMY, 17 Birch Hgts., Edwards NY 13635 USA.*

USI W/VE Islands Contest, sponsored by the US Islands Awards Program, from 1600Z July 31st until 2359Z August 1st, on HF bands, all modes. Categories: W or VE island station, non-island station, or island rover, plus DX non-island station. Non-island stations send signal report and state, province/territory, or country. Island stations send signal report, island name, and USI or CISA number. Scoring: 5 points for each W/VE island plus island operators score 1 point for each non-island station. Multipliers: each different state, province/territory, and for island operators each different DX. Work stations once per island. Awards. Send logs by Sept. 10th to USI contest manager *Ray Phelps AD4LX, 1440 SW 53rd Terrace, Cape Coral FL 33914 USA. E-mail [ad4lx@usa.net]; Web site [http://www.eng.mu.edu/~usi/].*

AUG 21–23

40th Annual New Jersey QSO Party, sponsored by the Englewood ARA, Inc. All amateurs the world over are invited to take part. (1) The contest is from 2000 UTC Saturday, August 21st to 0700 UTC Sunday, August 22nd, and from 1300 UTC Sunday August 22nd to 0200 UTC Monday, August 23rd. (2) Phone and CW are considered the same contest. A station may be contacted once on each band—phone and CW are considered separate bands. CW contacts may not be made in phone band segments. New Jersey stations may work other New Jersey stations. (3) General call is "CQ New Jersey" or "CQ NJ." New Jersey stations are requested to identify themselves by signing "DE NJ" on CW and "New Jersey calling" on phone. Suggested frequencies are 1810, 3535, 3950, 7035, 7135, 7235, 14035, 14285, 21100, 21355, 28100, 28400, 50–50.5, and 144–146. Suggest phone activity on the even hours; 15/10 meters on the odd hours (1500–2100 UTC); 160 meters at 0500 UTC. (4) Exchange consists of QSO number and QTH (state/province or country). New Jersey stations will send county for their QTH. (5) Scoring: Out-of-state stations multiply number of complete contacts with New Jersey stations times 3 points per QSO times the number of New Jersey counties worked (maximum of 21). New Jersey stations multiply number of complete contacts times 3 points per QSO times the multiplier. The multiplier is the sum of the number of states (other than NJ), Canadian provinces, and NJ counties worked—maximum is 49 + 13 + 21 = 83. (6) Certificates will be awarded to the first place station in each New Jersey county, state, province, and country. In addition, a second place certificate will be awarded when four or more logs are received. Novice, Technician, and mobile operator certificates may also be given. A total of four plaques have been donated by the ARRL Section Managers for NNJ and SNJ to the highest scoring single operator station residing in each of their sections (separate plaques may be awarded for Novice/Technician and all other classes). (7) Logs must also show the UTC date and time, QSO exchange, band, and emission, and be received not later than September 18th, 1999. The first contact for each claimed multiplier must be indicated and numbered and a checklist of contacts and multipliers should be included. Multi-operator stations should be noted and calls of participating operators listed. Logs and comments should be sent to *Englewood Amateur Radio Assn., Inc., P.O. Box 528, Englewood NJ 07631-0528 USA.* A #10-size SASE should be included for results. (8) Stations planning active participation in New Jersey are requested to advise EARA by August 1st of your intentions so that they may plan for full coverage from all counties. Portable and mobile operation is encouraged.

Number 56 on your Feedback card

UPDATE

Alert readers have quickly pointed out an identical error in both Fig. 1 and Fig. 2 of "Regens for the Millennium, Part 1" in our June 1999 issue: The 470k resistor is shown on the incorrect side of the 100–1000 pF cap.

Also, in Fig. 4 all caps should be 10–40 *micro*farads (µF).

We apologize for any inconvenience these oversights may have caused. — Ed.

QRX

continued from page 42

in unsurpassed vigor and cooperation, whatever the resident "contest man" suggests.

• Whenever OM bears relentless fright of tower height, others must climb said structure, unquestioningly, upon request.

• Coax cables may be routed to achieve the lowest loss, regardless of whether they cause doors, windows, etc., to be blocked or otherwise not to function. And if the house appears to be trapped in a sort of rubber "spider's web," that's a plus, rather than a minus.

Tnx and a don't forget all meals served in the shack to Hubert Daniel VE9DAN, Oyster River NB, via *X-Mitter*, newsletter of the Penn Wireless Assn., Howard Rubin N3FEL, editor.

A Mode Called CW

Considering upgrading? Heard the talk about CW being outmoded, and wondering whether it's worth expending the effort to become a Morse operator? Well, it is. Here are some facts to consider.

• CW requires less sophisticated, less expensive equipment than other modes. One result is that many third-world countries support CW as an inexpensive means for electronics students to gain on-the-air experience.

• CW can get through under difficult HF band conditions, when most other modes can't.

• Anyone who only has funds or antenna space for a "little pistol" station can take heart. With limited power and a small antenna, you can still produce a copyable CW signal—even in faraway countries.

• Many DX stations run only CW. If you wish to work those stations, you must speak their language.

• CW overcomes the language barrier. It is accent-free. (Well, almost: A few operators, using manual keys or "sidewinders," have distinctive "fists.") But with a few "Q signals," and standard phrases in English, you can have a conversation with someone who doesn't speak your language.

• CW is fun! It's a pleasure to get on the Novice CW bands, and see how far you can reach and whom you can contact. There is a great feeling of camaraderie in knowing that nearly everyone on the band is a beginner like yourself, that they are going through the same learning process you are. The routine CW contact—exchanging RST, QTH, name, then rig, weather, and maybe occupation—frees the newcomer from worrying about what to say. It promotes the sheer enjoyment of radio communications.

• For youngsters, CW removes the intimidation of talking to strange adults. The only way you learn the age of the other operator is if he or she tells you.

• CW is spectrum efficient. A CW signal is less than 500 Hz wide. So five CW stations can fit in the 0.5 kHz occupied by one station running SSB, RTTY, packet, or AMTOR. Those denigrating the value of CW seem to "forget" this essential fact.

• Lastly, because so many hams love CW, it's in no danger of dying out. So don't let the doomsayers worry you. Instead, jump in and give it a try. You might find yourself with a whole new sub-hobby to enjoy!

Tnx *à la mode* to the unknown author, via the February 1998 Frontier ARS newsletter, Jim Frye NW7O, editor; via the Sierra Intermountain Emergency RA *Sierra News*, N7MXA, editor (considerably edited down by AF6S); via the OH-KY-IN ARS in their April 1998 *The Q-Fiver*, Susie Scott N8CGM, editor.

NEVER SAY DIE

continued from page 4

neutrinos and, of course, a whole family of anti-particles.

Yes, I go pretty far afield in my editorials, trying futilely to get you to be healthier, wealthier, and wiser, but you're going to have to let me know if you really want to learn more about the particle zoo our physicists have exhumed with their pesky colliders. So, do you want me to publish Bob's paper? Why?

Frankly, I doubt that I'll ever hear a lepton conversation on a 75-meter roundtable.

Wheels

Never, in all my years in school, nor, for that matter, in talking with my parents — or even friends — did the subject of goals come up. Like most people, I suspect, I just floated along, making ad hoc decisions on the directions my life would take, but with no guidance (other than inertial) from me (or anyone else) that I can recall.

The first time the question of goals came up was when I was graduating from high school and guidance counselors were brought in to test us and help guide us.

I hadn't given the whole matter much thought, but it seemed like a good idea to go to Dartmouth and maybe be a lawyer. Well, that was 60 years ago, before lawyers had so thoroughly blackened the profession. My folks had a couple of good friends who were lawyers, but neither of them ever talked about it, so they weren't any influence. My father was in aviation, but he had so estranged me as a child that I didn't want to have anything to do with anything he was involved with, including smoking, drinking or fishing.

The guidance counselor looked at my test scores and said that I had an incredibly high mechanical aptitude, and in view of my interest in amateur radio, I really ought to go to an engineering college and take EE. Well, what the hell, so I did, ending up at Rensselaer Polytechnic Institute in Troy, New York. But I still hadn't a clue as far as any goals in my life were concerned.

The school system is pretty well standardized from kindergarten through high school — the years in which we are forced by law to go to school. Or else! But somewhere in high school kids ought to be encouraged to start thinking about what they might want to do with their lives so they could better educate themselves for it. Maybe they do that now, but I'll bet they don't.

The high school graduate has two main forks in the road to choose. One is to be educated so as to be a cog in a big wheel — to always be working for someone else. The other main route is to be a wheel. That, too, requires an education beyond high school, but it's one that, as far as I know, is not yet available from any colleges or universities I've visited or even heard about.

MIT has taken steps to encourage entrepreneurialism. I suspect they are leading the way. Good for them, if they're still doing it. I tried to get Rensselaer to help pioneer this route, but despite the endorsement of the RPI Council, the faculty torpedoed the idea and the president wasn't strong enough to override them. He quit.

Perhaps it takes a special temperament to be an entrepreneur. My grandfather, who was an inventor, was an entrepreneur, and he had a big influence on my life.

I'd like to see more emphasis put on starting and running one's own business. I am not a fan of big business. I still have a copy of a book written by a G.E. vice president who quit and wrote *Giant Business, Threat To Democracy*. And that was back around 1940. He sure has been proven right!

The real strength of America is in its small businesses, not in the *Fortune* 500 or our lawyers, doctors, and CPAs.

Nostradamus

Ed Dames' group of remote viewers checked out Nostradamus' quatrain 72 and told the Art Bell listeners that the prediction is that a terrorist biological attack will be made on the baseball fans at Shea Stadium in July 1999. How about that for being specific! Well, we'll see how it comes out. If they distribute something catching, the thousands of baseball fans could spread the contagion through the whole city in short order.

The Clinton gang has added considerably to the hate-Americans mentality in the whole Muslim world with their wag-

Continued on page 58

NEVER SAY DIE

continued from page 57

ging the dog attacks on Iraq, Sudan, and Afghanistan.

How well can our intelligence groups, with their miserly budget of only $40 billion a year, protect us? Have you bothered to pop down to your neighborhood Barnes and Noble yet for an $8 copy of their hardbound book by Mike Lanning, *Senseless Secrets*, a chronicle of the endless failures of military intelligence?

Or is Ed Dames full of … er … baloney?

Literacy

Time had a short item reporting on a study that showed that almost half of Americans over the age of 65 are functionally illiterate. Why am I not surprised?

The NH Economy

A survey showed that 70% of NH high-tech businesses are looking for more workers. We're so short of high-tech people up here that half of the companies are actively recruiting and hiring foreign workers. And I don't mean from Michigan, either.

New Hampshire has the most concentrated technology work force of any state — 79 high-tech workers per 1,000 people. And we have over 1,000 software companies, plus a NH Software Association! More than half of New Hampshire's exports are technology-related. New Hampshire's lifestyle, tax structure, and work ethic are attracting high-tech businesses. We have the highest growth of new, good-paying, high-tech jobs in New England. We are a "high-tech state."

New Hampshire is always on the top of any survey of the best places in America to live and for companies to locate. The lack of any personal income tax or sales tax is a plus, though we do have one of the highest property taxes in the country. But that's okay as long as you don't have an ego which demands a lot of land and a big home. If I had my druthers I'd live in a tarpaper shack on maybe two acres on a hill, away from any neighbors, and build most of my home underground where the tax assessor couldn't see it. Well, I don't need windows to store my books or CDs, for my office, or even for a ham shack. It would be cheap to heat and cool, and would still be around if any of the threatened disasters wipes out most of mankind. And the above-ground tarpaper shack.

Rationalization

Politicians have to be able to rationalize almost anything if they are going to accept bribes (a.k.a. campaign donations) or go along with a party line. But I watched with open wonder as almost all of the Democrats managed to swallow what little, if any, pride they have left by ignoring the repeated presidential perjuries and the orchestrated campaign of obstruction of justice. They have all condoned perjury and obstruction rather than punished it. They're saying that any future president can violate the laws of the land with no serious consequences.

Lenin, Hitler, and Mao were all popular with their people, and the power that that gave them was paid for with tens of millions of lost lives.

Over 40

90% of the business startups last year were launched by people over 40 who were tired of being downsized, laid off, or outsourced. They were fed up with working for someone else. The year before, only 73% chose a startup over seeking new employment. The word is getting out.

I've been hoping to get through to people 20 years or so earlier in their careers and help them avoid ever being laid off or downsized. But our whole society is so totally brainwashed over the importance of a college degree that eyes are blind and ears deaf to any other ideas. Worse, those too poor to go to college feel they have to settle for working for someone for a low wage. Maybe we need to have some of those micro-lenders in the US that in India and other poor countries are helping poor people start their own small businesses.

The business world has changed in the last 20 years. There are no more $12-an-hour union jobs, and both couples have to work to make the same effective pay as one used to make. 25% have to work two jobs, according to one report! In New England, 15% of the workers are self-employed, up from under 10% 20 years ago.

The Bioelectrifier

More and more letters have been arriving from happy bioelectrifier users. No complaints yet! Letters tell of not getting colds or the flu, even though they're going all around them — a weight gain for people who have been too thin, and weight loss for the fatties (which these days seems like almost everyone). Lots of "I've never felt better!" letters. Well, if you get rid of parasites or yeast infections which may have been around for a long time, that'll improve your body's ability to deal with germs and viruses.

Sunscreen Warning

If you get waterproof sunscreen into your eyes, you're going to have to be driven to the nearest hospital ER so they can flush it out with a special medication. Water can make it worse! It turns out that young children, in particular, get the sunscreen into their eyes and completely lose their sight. It's tough enough in this world when you have everything going for you. And how would you feel if you knew that your ignorance blinded your child. Or you, for that matter.

That reminds me of my editorial report that mice, fed the normal American diet, got skin cancer when exposed to sunlight. Those fed raw food did not.

The New Machine!

When Les Earnshaw demonstrated the new Kachina at Dayton, you can bet that the competition was all eyes, ears, and cameras. Well, this is the first really new development in ham gear in about 30 years — since the advent of sideband, solid state, and synthesized tuning. How long will it take before we see Japanese copies?

What I'd like to get is some letters from Kachina users — from the kind of hams who are the first to try new technologies, while everyone else waits. How totally has our public school system killed the pioneering spirit that got our country started just over a couple hundred years ago?

How about it, guys? Are you having a ball with your Kachina? Tell us about it! Let's see some letters.

For that matter, I'd love to see letters from any of you who are trying new stuff. Are you having a ball with slow scan, packet, RTTY, or what? Help me to get others out of their rut and enjoying the excitement amateur radio has to offer.

HDTV

For the last few years we've been threatened with high definition television. Yawn. I love the HDTV prices and the usual argument over standards. I like Tom Sowell's remark, "Is it really worth it to pay more money to see the same junk in sharper detail?" Heck, being a maverick and refusing to be dictated to by the networks as to when I'm going to watch their garbage, I tape anything I might want to look at and view it at my convenience, not theirs. And, I do all my taping at SLP because I don't really care for the improvement in picture quality I'd get at SP.

I do enjoy getting the latest gadgets, but they have to be cost effective, and seeing Springer, Roseanne, Oprah, and Geraldo clearer is not attractive. Not even the best of TV (like *Law & Order*) are worth it. Shove it, guys.

Sweet Deal

Maybe you missed the little item in a news magazine

showing that members of the House Banking Committee got an average of $33,000 from commercial bank PACs vs. $500 average for House members not on the committee. The Banking Committee members got an average of $20,000 more from securities firms and insurance company PACs. One thing we know for sure — none of the legislation these PACs bought is going to benefit us. We're just the dumb suckers who keep giving these crooks their ticket to ride the gravy train with bigger and bigger deductions from our paychecks before we even see them. ...

Hospital Job Security

I've been fussing with you about the need for you and your family to drink pure water. And that's water without added chlorine and fluorides. But what about when your kids are at school or you're in the hospital? Bad news.

A letter from a reader points out that almost all hospitals have water softening systems, as do most schools. These result in the copper pipes being rapidly eaten away. High levels of copper cause psychotic behavior. Just what a hospital's mental patients need! Just what the hospital needs to ensure their being long-term residents. Might this be contributing to the psychological problems children are having in schools? Of course it is.

Be sure you have pure drinking water at home, and arm your kids with bottles of water when they head off to school. Assuming you are still making sure your kids will be robbed of creativity, motivation, and brain development by sending them to public school in the first place.

Those Darned ETs

If you've been listening to the Art Bell W6OBB show you've heard a seemingly endless stream of experts testifying that the government knows about UFOs and ETs, but isn't telling us about it. The word must be leaking out to the general public, because a recent national poll showed that 80% of the people believe that the government would *not* tell us about ETs if they knew about them.

They know. But think what the reaction would be if the president went on TV and said well, yes, we're being visited by aliens, but their technology is so far ahead of ours that there isn't anything whatever that we can do about it. Further, we don't know for sure why they're here. We don't know how long they've been visiting. We don't know where they come from, or possibly when. We don't even know how many different kinds of aliens there are.

Oh yes, by the way, we've spent over a trillion dollars of your money trying to keep track of the aliens and to cover up what we've discovered so you wouldn't have to worry about them.

Power Leak

A reader sent me a newsletter from the American Public Power Association with the headlines that a Canadian study found no clear link between EMF and leukemia. Why does that remind me of the tobacco company executives all swearing before a congressional committee that there was no proof that their product was a health hazard or addictive?

Scientific Progress

Science *has* progressed, despite the best efforts of the scientific establishment to prevent it. At least two Nobel laureates have admitted that they lied about their proposed research work on their grant applications because they knew the peer review process would never allow them to pursue their real goals.

This peer review process has prevented most truly innovative papers from being published in the scientific journals. An article in the *JAMA* pointed out that "...some of the most distinguished of scientists may display sophisticated behavior that can only be described as pathological."

History supports the blindness of scientists when faced with something new, from Copernicus to Galileo, Darwin, Mendel, Ohm, Young, Harvey, Flemming, Wegener, Semmelweis, Pasteur, Lister, and so on.

The tomato was shunned in America for over 200 years after it was accepted in Europe because "everyone knew" it was poisonous.

The scientific establishment was horror-struck when Pons and Fleischmann, two respected electro-chemists, held a press conference to announce cold fusion instead of submitting their paper to a peer-reviewed journal. Not being total dummies, P&F knew they'd just be wasting precious months going the peer review route, there being no peers in this solid-state microfusion new field, and the reaction they'd discovered was well known to be totally impossible.

When one of the pioneers in this new field, distinguished professor Ed Storms, opined that the transmutation of elements was involved in the generation of excess heat, his colleagues at Texas A&M ganged up and tried to have him fired for suggesting such heresy. Witch burning is apparently still popular in Texas.

Plant Growth

With the development of a rotary transducer in 1966, it became possible to measure plant growth to an accuracy of ±0.001 inches. This made it possible to much more accurately measure the effect of thought on plant growth. The experiment was set up growing some rye seeds. The strip recorder showed that they were growing at a steady 0.00625 inches an hour. Olga Worrall, a well-known psychic who was 600 miles away, was called and asked to speed up the growth at a specific time. The strip was steady until that time, when it suddenly went to 0.0525 inches an hour! The growth gradually slowed down over the next 48 hours, but it never went back to its original rate. Olga's thoughts accelerated the rye growth by eight times, just by concentrating her thoughts on it remotely.

If thoughts can affect plants that powerfully, I wonder what they can do for or to humans? Maybe there's more to voodoo and witch doctors than just imagination.

But you don't have to be a psychic to demonstrate the power of thought to influence plant growth. You can do it in your kitchen with some seeds planted in plastic cups of dirt. Your positive thoughts will accelerate the growth and your negative thoughts will slow it down.

Enough Hours

This is about me. Well, hell, I keep asking the people who hear me on the Art Bell show to tell me something about themselves, so I'll share a little of my life with you.

My main problem is that there is so much to do and so few hours. There are so many books on my shelves that I haven't read yet, each one a treasure of information and ideas. Each one an adventure of the mind. Then there are the Dilbert books which have me roaring with laughter.

I've got thousands of CDs that I want to listen to over and over again. The thrill of the Gottschalk Tarantella, the incredible beauty of Delius' music. Nirvana. The Offenbach cello concerto, which I've only played a thousand times so far. Talk about industrial strength stress reduction!

Oh, how I wish you could share with me the books, the music, and my walks in our north pasture, where every few days bring out a new array of wildflowers. The excitement of seeing the wildlife—a dozen deer in our front yard, a dozen or so wild turkeys going methodically across the pasture I can see over my Macintosh as I write, the wolf I spied out my bedroom window the other morning. Pheasants, raccoons, bears,

Continued on page 60

NEVER SAY DIE

continued from page 59

elk, coyotes, buzzards, we've got 'em all.

There's the fun of writing. I have this need to teach, so I research things that interest me and then write about them—to share with you what I've learned. I try to make it entertaining, as teaching should always be. Oh, how I remember the struggle I had to stay awake in class as a teacher droned on. And the day the professor pointed to one of the students and shouted, "You! Wake up that man next to you!" He answered, "You wake him up, you put him to sleep," which got a huge laugh from the bored students and almost killed the professor with apoplexy.

Strong-Arm Tactics

Oh, dowsing skeptic, you who haven't bothered to read any books on the subject, or to try even the simplest of dowsing techniques for yourself, I have a little test for you. A letter from an Art Bell listener triggered this.

A long time ago I reviewed the marvelous book *Vibrations*, by Owen Lehto. It's available from the Acres USA Bookstore, or direct from the author for $20 postpaid. See my *Secret Guide to Wisdom* for his address. Owen shows how anyone can test whether something is good for them to eat or not just by holding the item in the left hand (if they're right-handed) and letting the right arm hang down at the side. If the right arm makes small clockwise circles, that's positive. It's okay. If it goes counterclockwise, it's no good for you.

I read the book, tried his system, and it immediately worked for me. So I went to the office and asked several of the people there to hold an apple in their left hand and let their right arm hang loose. I didn't tell them what was supposed to happen. You got it right, their arms made small clockwise circles. Then I put a piece of candy in their left hand and watched their right arm make counterclockwise circles. It worked for everyone!

Another approach is to hold the right arm out and have someone push down on it. The bad stuff makes the arm weak and easily pushed down. Good stuff makes it almost impossible to push down.

My correspondent used this technique to test for EMF effects from pole transformers. He found that arms began to lose strength at about 0.1 milligauss! The accepted radiation level has been 1.0 milligauss, with power companies accepting anything under 10.

What I'd like to know is what effect our ham rigs are having on us. How about doing the arm test at different points in and out of your house to see what your body's milligauss meter says? Test first with the rig off to see what EMF field effects are there. Then turn on the rig and see what changes that makes. Let me know, okay?

You can also test for the effects of underground streams that may run under your home and be causing long-term health problems. You can read more about this in the dowsing books. And if your skepticism is at full force, know you that these underground stream effects have been measured with scientific instruments.

Home Power

The TV magazine shows have finally started pushing Y2K nervousness. It started in May with a *60 Minutes* interview with the woman in charge of Y2K for Washington DC. She admitted that there is a good possibility that the power grid could go down for a few days to a few weeks. I think reality is finally beginning to soak in.

So what does this mean to you, oh great communicator? It means that if the power goes down, taking with it the telephones, and probably the satellites too, about all communities are going to have left are some CBers, with very limited range, and you, brother ham. That's assuming that you've bothered to upgrade so you can use the HF bands and talk to more than someone within sight. How many repeaters have emergency power systems so they can keep going indefinitely when the power companies are on an extended vacation?

Art Bell W6OBB has put in a whopping solar power system, plus a windmill. I don't think there's anyone in the country who is more knowledgeable about the potential Y2K problems than Art. He's interviewed all of the top experts on his show. In depth. And Art is sincerely worried by what he's learned.

Okay, so what should you get to keep you on the air when the lights go out? A car rig is fine. Or, at least it will be for a day or two. But with the power off, gas pumps won't work, so you'll soon run out of gas. You're going to want to think in terms of solar and wind, just as Art has. And that means that you're going to spend $22.50 and subscribe to *Home Power* magazine, Box 520, Ashland OR 97520, tel. (800) 707-6585. It's edited by Richard Perez N7BCR. His whole crew are hams, and their offices are solar powered. His magazine is packed with great articles on home power systems. Plus ads you'll want to see.

Dayton Bombs

The number of exhibitors was down, with many empty booths. The flea market was down. Attendance was way down. The benefit was that it was a lot easier to get around or to get food. The downside was that there was less to see and less to buy. Many of the exhibitors who did come were crying the blues. And the percentage of computer-oriented exhibitors was up.

I looked over their list of speakers to see what I'd miss if I didn't go this year, thereby saving me almost a week of my time. I found very few speakers who looked interesting. Oh well, that meant more time to get around to the exhibits. But couldn't the organizers have lined up at least one star attraction?

Only the HamVention Committee knows what the actual paid attendance was, and I doubt they'll share this information. The guestimates I've heard put the attendance at around 15,000—about half what it was just a few years ago.

And that makes sense since the number of new HF hams has dried up, and there isn't a lot of attraction for our nocoders at an ARRL-dominated convention. The sad truth is that little has changed in the HamVention formula in the last 40 years, while technology has been going through the roof. It, like the code, is a monument to amateur radio's past.

I attended my first HamVention in 1955. The only difference was that it was then small enough to be held in the Dayton Biltmore Hotel. I attended my first hamfest in 1938 in New York City and, other than the computer exhibitors, I would be hard put to cite any significant changes in the hamfest format back sixty years ago from Dayton today.

The Tesla Society

The International Tesla Society in Colorado Springs seemed to be doing well for many years, hosting some fascinating yearly conferences. I attended three of 'em and was a speaker on cold fusion developments at one. Their book shop was a treasure chest of interesting books. They made far more money on me at their book store during their conferences than from the conference fees. They always had a ham station set up in the hosting hotel lobby, with plenty of hams attending their conferences. Though they attracted a lot of phonies as speakers, they also managed to find some who had valuable information, helping me to make some wonderful contacts.

So I was surprised and disappointed when the Tesla Society stopped sending magazines and disappeared, with no more conferences announced.

Then came an announcement of an Exotic Research conference in Seattle in March, listing quite an array of

speakers. I was disappointed not to see me listed, but them's the breaks. I really enjoy talking to a room full of people, and the bigger the room, the better. Heck, I haven't the slightest qualms about talking to Art Bell's millions of listeners. On the other hand, traveling to Seattle for a conference would take almost a week out of my life, putting me one more week behind in my work. And all that to talk with a couple hundred or so attendees. Plus I'd get to listen to some interesting talks and meet some fascinating people. And some turkeys.

Then an identical announcement came in for a conference in Mesa (AZ) July 22nd–25th. Same cast of characters. Hmm. So I called and found that there were some postal problems which resulted in the Seattle conference being canceled. You can get the details on where and who will be speaking about what from Exotic Research, Box 411, Stanfield AZ 85272, or call (800) 417-6399.

I asked what had happened to the Tesla Society, and was told that they'd gone bankrupt and that Dennis Lee had bought their assets. I'd wondered what Dennis was doing these days. The last I'd heard he had been taking his magic act around the country selling distributorships for his nonexistent products. My letters to him have gone unanswered. I did enjoy the video of him demonstrating his "inventions," but since they seemed to defy any scientific explanation, I was skeptical. I read his book, which told about him being put in prison as a confidence man. Well, we'll see what comes of his Tesla Society purchase.

Nightlights

An article in *Nature* (May 13th) reported a strong correlation between nearsightedness in children and the use of nightlights when they were babies. The same phenomenon has been observed in chicks, so it was no big surprise.

Well, it makes sense that nightlights could affect children. Up until Tommy Edison invented the electric light, people tended to go to sleep when it got dark, so this is a pattern which has been embedded in the deepest and oldest part of the brain, what's called the reptilian brain. You mess with deeply embedded life patterns at your risk. Oh, the many ways we are unknowingly deforming our children!

If parents were aware that smoking, even before conception, would to some degree deform their children, would that be enough to get them to stop? And the same goes for eating sugar, white flour products, pasteurized milk and growth hormone and antibiotic-loaded beef. These poisons all affect the sperm and ova.

"But Mommy, I'm afraid of the dark!" "All the better for the bogey man to sneak out from under your bed and get you, my dear."

And if that isn't enough, if you'll read about melatonin you'll find that even the light when you go to the bathroom at night will stop your body from making melatonin. The light hits your eyes and the message goes to your system that it must be morning, so stop making melatonin.

So what? Spring $7 for Dr. Reiter's Bantam book, *Melatonin*, and read for yourself. This stuff, normally made in the pineal gland, helps you sleep sounder, combats jet-lag, counteracts stress, fights off viruses and bacteria, plays a role in how long you live, and even helps protect you from cancer and heart disease. So don't screw around with your melatonin factory by leaving a light or your TV on at night. You may also want to take some supplementary melatonin just before going to bed at night, since as you get older your melatonin factory gets lazy, contributing to your ability to die sooner than might otherwise happen.

Delinquents

As I was reading Dr. Weston Price's *Nutrition and Physical Degeneration*, a 60-year old book that is still in print, and well deserves to be, my ideas about what's gone wrong so that kids are killing kids were confirmed. I bought the book because Dr. Price was a pioneer in the nutrition field, and I'd read his *Degeneration/Regeneration* many years ago and was very impressed by his research. He showed how destructive sugar was to the endocrine system—how that even a teaspoon of refined sugar would upset the calcium-phosphorus ratio in the blood for a whole day, contributing to arthritis and other immune-system disorders.

Dr. Price spent years visiting people living in remote areas of the world, studying their health and teeth. What he discovered was amazing. He found that groups living on their native foods were incredibly healthy, lived long productive lives, and had perfect teeth. They had no need for doctors or dentists.

But then, when the outside world reached them and they were introduced to sugar and white flour products, their teeth started having cavities, their jaw structures changed, their health disintegrated, and they started dying at much earlier ages. But sugar and white bread are addictive, and the results of the diet change were so long in happening that no one noticed the connection.

He visited people early in this century in the remote islands off the Scottish coast, people living in a Swiss village that was cut off from the rest of the country, South Sea islanders, Eskimos, and so on. The story was the same everywhere, and the photos in this well-illustrated book proved what he'd discovered.

He also found that crime was virtually unknown to these people before sugar and white bread were introduced. A generation later, kids were doing criminal things.

I suspect that if we could eliminate sugar and white bread from our American diet, the inner city gangs would disappear and crime would be an anomaly instead of the meat of most newspapers and TV shows. But we're so addicted to pie, ice cream, and candy that I doubt anything can be done, so we'll just have to get used to kids killing kids and stop bitching about it. We'll have to build more prisons and spend more housing the criminals we're making. Well, it's good business for lawyers, judges, the courts, police, prison guards, and so on down the line. We wouldn't want to put millions of lawyers out of business, now, would we? Having no other skills, we'd have to increase our welfare system's cost. Judges, at least, could go on TV for a while and make a buck.

The 524-page 6th edition by Dr. Price is $20, ISBN 0-87983-816-7, Keats Publishing, Box 876, New Canaan CT 06840. Dr. Price is not a great writer, but his data is unassailable and fascinating.

The next time you order apple pie and ice cream, remember that it is shortening your life as surely as smoking a cigarette, and that if you eat this crap before you conceive a child it is going to some degree deform your child, physically and mentally. It's no wonder that kids are going berserk and their grades are plummeting.

Connections

You, I, and everyone else have allowed Congress to gradually increase our taxes, year by year, decade by decade, from the 2% of our salaries 90 years ago, when the income tax was started, to over 50% today. Well, it's fun spending money—particularly when it isn't your money. So we have been electing and then re-electing politicians who have been having a great time spending our money, and then taxing us further so they can spend even more.

In my editorials, I've written about the many unbelievably wasteful programs we've allowed Congress to enact. Like the "War on Drugs," which has

Continued on page 64

Number 62 on your Feedback card

PROPAGATION

Jim Gray W1XU/7
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[jimpeg@netzone.com]

July

July is never a particularly good month for DX on the HF bands due to high signal absorption levels, and particularly *this* July because we are in the early stages of sunspot cycle 23, in which the solar flux values remain disappointingly low. VHF can be quite good, along with meteor scatter opportunities (Delta Aquarids) for about ten days beginning July 29th.

Your *best* time to work HF band DX will be the 3rd–6th, 19th–21st, and the 25th. The *poorest* days are likely to be the 13th–17th and the 31st. Remaining days will be Fair or trending between one condition and another (see calendar).

There will be a partial lunar eclipse on July 28th, visible in parts of Antarctica, southern and western parts of South America, Central America, parts of North America (except north of Alaska), the Pacific Ocean, Australasia, and eastern parts of Asia.

By the way, if you're interested in weather and other geophysical phenomena, keep a sharp lookout for "conditions" surrounding the 13th and 26th and *semper paratus.*

August

There will be a full solar eclipse on August 11th in the northeastern USA, northern Canada, the North Atlantic Ocean, Europe (including the British Isles), North Africa, Asia (except the eastern part), and the northern Indian Ocean. The eclipse will be partial elsewhere. Totality will occur at approximately local noon.

As usual, the HF bands in August will be recovering from dull summertime conditions, but are not expected to become fully active until September. Sunspot cycle 23 continues to be disappointingly sluggish, with only occasional spurts of the Solar Flux Index to the neighborhood of 200. To take advantage of these times, listen to WWV on 10 MHz at 18 minutes after any hour for the report of "Solar-Terrestrial Conditions."

You can see from the August calendar that there are likely to be a few Good (G) days this month: the 10th, and the 25th–27th. The Poorest days (P, VP) are likely to be on the 4th, 5th, and 19th–21st, which are expected to exhibit some solar flare activity and a very active magnetic field with accompanying ionospheric disturbances. There is a distinct possibility of other geophysical upsets such as earthquakes, hurricanes, and tornadoes at these times. However, conditions following recovery from the poorest days are likely to be very good.

Please note that the band-by-band forecast and the band-time chart are the same for both July and August.

Band-by-band forecast

10–12 meters

Possible short-skip opening due to sporadic-E ionization out to 1300 miles should occur on most days, and to occasionally longer distances on a few days.

15–17 meters

Regular north-south path openings and occasional openings

Continued on page 64

July 1999

SUN	MON	TUE	WED	THU	FRI	SAT
				1 F	2 F-G	3 G
4 G	5 G	6 G	7 G-F	8 F	9 F	10 F
11 F	12 F-P	13 P	14 P	15 P	16 P	17 P-F
18 F-G	19 G	20 G	21 G	22 G-F	23 F	24 F-G
25 G	26 G-F	27 F	28 F-G	29 G-F	30 F	31 F-P

August 1999

SUN	MON	TUE	WED	THU	FRI	SAT
1 G-F	2 F	3 F-P	4 P	5 P	6 P-F	7 F
8 F	9 F-G	10 G	11 G-F	12 F	13 F	14 F
15 F	16 F	17 F	18 F-P	19 P	20 P-VP	21 VP-P
22 P-F	23 F	24 F-G	25 G	26 G	27 G	28 G-F
29 F	30 F	31 F-G				

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA							20	20				
ARGENTINA	10/15	20	20	20	20						10/15	10/15
AUSTRALIA	15	15	15/20	15/20	40/80	40/80	20					15
CANAL ZONE	15	20	20	20	40	40	20	20	20		10	15
ENGLAND	20	20	20		40						20	20
HAWAII	15	15	15/20	20	40/80	40/80						15
INDIA	20	20										
JAPAN							20	20				
MEXICO	15	20	20	20	40/80	40/80	20	20	20		10	15
PHILIPPINES	15	15	15/20	15/20	40/80	40/80	20					
PUERTO RICO	15	20	20	20	40	40	20	20	20		10	15
RUSSIA (C.I.S.)	20	20										20
SOUTH AFRICA		40/80	40/80	20	20	20	20				20	20
WEST COAST	40/80	40/80	40/80	40/80	40/80	40/80	40/80		10/20	10/20		

CENTRAL UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA							40/20	20				
ARGENTINA	15/20	20/40	20/40								15	15/20
AUSTRALIA	15			20	20/40	20/40	20/40					15
CANAL ZONE	20	20	20	40/80	40/80		20	20	15	15	10	10
ENGLAND	20	20	20/30	40	40		20	20				20
HAWAII	15	15	20	20	20/40	40	40	20	20			15
INDIA			20	20								
JAPAN						40/80	40/80	20	20			
MEXICO	20	20	20	40/80	40/80		20	20	15	15	10	10
PHILIPPINES	15			20	20/40	20/40	20/40					15
PUERTO RICO	20	20	20	40/80	40/80		20	20	15	15	10	10
RUSSIA (C.I.S.)	20	20	20					20				20
SOUTH AFRICA				20/40	20/40	20						

WESTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA					20	20	40/80	20	20			
ARGENTINA	15/20	15/20	20	20	40	40						15
AUSTRALIA	15	15	15	20	20		40/80	20/40	20			
CANAL ZONE	10/15	15/20	15/20	20/40	40	40		20	20			10
ENGLAND	20	20										
HAWAII	15	15	15	20	20/40	20/40	40		20	20		
INDIA								20	20			
JAPAN				20	20	40/80	40/80		20	20		
MEXICO	10/15	15/20	15/20	20/40	40	40		20	20			10
PHILIPPINES	15	15	15	20	20		40/80	20/40	20			
PUERTO RICO	10/15	15/20	15/20	20/40	40	40		20	20			10
RUSSIA (C.I.S.)	20	20	20					20	20			20
SOUTH AFRICA				20	20							
EAST COAST	40/80	40/80	40/80	40/80	40/80	40/80	40/80		10/20	10/20		

Here are some of the books Wayne has written. Some can change your life, if you'll let them. If the idea of being healthy, wealthy and wise is of interest to you, start reading. Yes, you can be all that, but only when you know the secrets which Wayne has spent a lifetime uncovering.

Radio Bookshop

The Secret Guide to Health: Yes, there really is a secret to regaining your health and adding 30 to 60 years of healthy living to your life. The answer is simple, but it means making some very difficult changes. Will you be skiing the slopes of Aspen with me when you're 90 or doddering around a nursing home? Or pushing up daisies? No, I'm not selling any health products. $5 (H)

The Secret Guide to Wealth: Just as with health, you'll find that you have been brainwashed by "the system" into a pattern of life that will keep you from ever making much money and having the freedom to travel and do what you want. I explain how anyone can get a dream job with no college, no résumé, and even without any experience. I explain how you can get someone to happily pay you to learn what you need to know to start your own business. $5 (M)

The Secret Guide to Wisdom: This is a review of around a hundred books that will help you change your life. No, I don't sell these books. They're on a wide range of subjects and will help to make you a very interesting person. Wait'll you see some of the gems you've missed reading. $5 (B)

Cold Fusion Overview: This is both a brief history of cold fusion, which I predict will be one of the largest industries in the world in the 21st century, plus a simple explanation of how and why it works. This new field is going to generate a whole new bunch of billionaires, just as the personal computer industry did. $5 (C)

The Bioelectrifier Handbook: This explains how to build or buy a little electrical gadget that can help clean the blood of any virus, microbe, parasite, fungus or yeast. The process was discovered by scientists at the Albert Einstein College of Medicine, patented, and then hushed up. It's curing AIDS, hepatitis C, and a bunch of other serious illnesses. The circuit can be built for under $20 from the instructions in the book. $10 (A)

Moondoggle: After reading René's book, *NASA Mooned America*, I read everything I could find on our Moon landings. I watched the videos, looked carefully at the photos, read the astronaughts' biographies, and talked with some of my readers who worked for NASA. This book cites 25 good reasons I believe the whole Apollo program had to have been faked. $5 (D)

Mankind's Extinction Predictions: If any one of the experts who have written books predicting a soon-to-come catastrophe which will virtually wipe us all out are right, we're in trouble. In this book I explain about the various disaster scenarios, from Nostradamus, who says the poles will soon shift, wiping out 97% of mankind, to Sai Baba, who has recently warned his followers to get out of Japan and Australia before March6th this year. The worst part of these predictions is the accuracy record of some of the experts. Will it be a pole shift, a new ice age, a massive solar flare, a comet or asteroid, or even Y2K? I'm getting ready, how about you? $5 (E)

Wayne's Submarine Adventures in WWII: Yes, I spent from 1943-1945 on a submarine, right in the middle of the war with Japan. We almost got sunk several times, and twice I was in the right place at the right time to save the boat. What's it really like to be depth charged? And what's the daily life aboard a submarine like? There are some very funny stories. If you're near Mobile, please visit the Drum. $5 (S)

Improving State Government: Here are 24 ways that almost any state government can cut expenses enormously, while providing far better services. I explain how any government bureau or department can be gotten to cut its expenses by at least 50% in three years and do it cooperatively and enthusiastically. I explain how, by applying a new technology, the state can make it possible to provide all needed services without having to levy *any* taxes at all! Read the book, run for your legislature, and let's get busy making this country work like its founders wanted it to. Don't leave this for "someone else" to do. $5 (L)

Travel Diaries: You can travel amazingly inexpensively – once you know the ropes.Enjoy Sherry and my budget visits to Europe, Russia, and a bunch of other interesting places. How about a first class flight to Munich, a rented Audi, driving to visit Vienna, Krakow in Poland (and the famous salt mines), Prague, back to Munich, and the first class flight home for two, all for under $1,000. Yes, when you know how you can travel inexpensively, and still stay in first class hotels. $5 (T)

Wayne's Caribbean Adventures: More budget travel stories – where I visit the hams and scuba dive most of the islands of the Caribbean. Like the special Liat fare which allowed us to visit 11 countries in 21 days, with me diving all but one of the islands, Guadeloupe, where the hams kept me so busy with parties I didn't have time to dive. $5 (U)

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Reprints of My Editorials from *73*.

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Grist II: 50 more choice non-ham editorials from before 1997. $5 (G)

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Code Tape (T5): This tape will teach you the letters, numbers and punctuation you need to know if you are going on to learn the code at 13 wpm or 20 wpm. $5 (T5)

Code Tape (T13): Once you know the code for the letters (T5) you can go immediately to copying 13 wpm code (using my system). This should only take two or three days. $5 (T13)

Code Tape (T20): Start right out at 20 wpm and master it in a weekend for your Extra Class license. $5 (T20)

Code Tape (T25): Same deal. It doesn't take any longer to handle 25 wpm as it does 13. Or use the ARRL system & take six months.$5 (T25)

Wayne Talks at Dayton: This is a 90-minute tape of the talk I'd have given at the Dayton, if invited. $5 (W1)

Wayne Talks at Tampa: This is the talk I gave at the Tampa Global Sciences conference. I cover cold fusion, amateur radio, health, books you should read, and so on. $5 (W2)

Stuff I didn't write, but you need:

NASA Mooned America: René makes an air-tight case that NASA faked the Moon landings. This book will convince even you. $25 (R1)

Last Skeptic of Science: This is René's book where he debunks a bunch of accepted scientific beliefs – such as the ice ages, the Earth being a magnet, the Moon causing the tides, and etc. $25 (R2)

Elemental Energy Subscription: I predict this is going to be the largest industry in the world in about 20-30 years. They laughed at me when I predicted the personal computer growth in 1975. PCs are now the third largest industry in the world. The elemental energy ground floor is still wide open, but then that might mean giving up watching ball games and talk shows on the boob tube. $30 for six issues. (EE). A sample issue is $10.

Three Gatto Talks: A prize-winning teacher explains what's wrong with American schools and why our kids are not being educated. Why are Swedish youngsters, who start school at 7 years of age, leaving our kids in the dust? Our kids are intentionally being dumbed down by our school system — the least effective and most expensive in the world. $5 (K)

......Wayne

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The *73* Flea Market, Barter 'n' Buy, costs you peanuts (almost)—comes to 35 cents a word for individual (noncommercial!) ads and $1.00 a word for commercial ads. Don't plan on telling a long story. Use abbreviations, cram it in. But be honest. There are plenty of hams who love to fix things, so if it doesn't work, say so.

Make your list, count the words, including your call, address and phone number. Include a check or your credit card number and expiration. If you're placing a commercial ad, include an additional phone number, separate from your ad.

This is a monthly magazine, not a daily newspaper, so figure a couple months before the action starts; then be prepared. If you get too many calls, you priced it low. If you don't get many calls, too high.

So get busy. Blow the dust off, check everything out, make sure it still works right and maybe you can help make a ham newcomer or retired old timer happy with that rig you're not using now. Or you might get busy on your computer and put together a list of small gear/parts to send to those interested?

Send your ads and payment to: *73 Magazine*, Barter 'n' Buy, 70 Hancock Rd., Peterborough NH 03458 and get set for the phone calls. The deadline for the October 1999 classified ad section is August 10, 1999.

President Clinton probably doesn't have a copy of *Tormet's Electronics Bench Reference* but you should. check it out at [www.ohio.net/~rtormet/index.htm]—over 100 pages of circuits, tables. RF design information, sources, etc. BNB530

DFjr direction finder and MicroPLL programmable transmitter (formerly Agrelo) are now back under new management! Check exciting new accessories and upgrades. Order online at **www.swssec.com** or call SWS Security at 410-879-4035 (9-5 ET). BNB220

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TELEGRAPH COLLECTOR'S PRICE GUIDE: 250 pictures/prices. $12 postpaid. **ARTIFAX BOOKS**, Box 88, Maynard MA 01754. Telegraph Museum: [http://wltp.com]. BNB113

Propagation

continued from page 62

toward Europe and Africa peaking during local afternoon hours can be expected.

20 meters

This is likely to be the best band for worldwide propagation of signals that will be strongest an hour or two after local sunrise and again in the late afternoon and early evening hours. Short-skip beyond 500 miles should be good as well.

30–40 meters

You can expect DX openings during local evening, nighttime, and sunrise hours, limited by high noise levels due to thunderstorms along the signal path. Peak conditions occur toward the east around midnight and in other directions just before sunrise. Short-skip up to 1000 miles should occur during daylight hours, and 500–2300 miles at night is likely.

80 meters

Some short-skip propagation of 250 miles or so may occur during daylight hours and to 2,000 miles or so at night, but *no* daytime DX will take place due to signal absorption. During hours of darkness and just before sunrise, however, DX is possible to some areas of the world. High noise levels due to thunderstorms along the signal path will limit both short-skip and DX communication.

160 meters

No daytime propagation expected, but some DX and short-skip propagation should take place at night in spite of high static noise levels.

Never Say Die

continued from page 61

cost trillions and accomplished absolutely nothing. Like the "War on Poverty," which has only enriched the government bureaucracy, and hasn't done spit when it comes to having fewer poor.

The letters NRA have been in the news a lot lately — remember, Never Re-elect Anyone.

73 Amateur Radio Today

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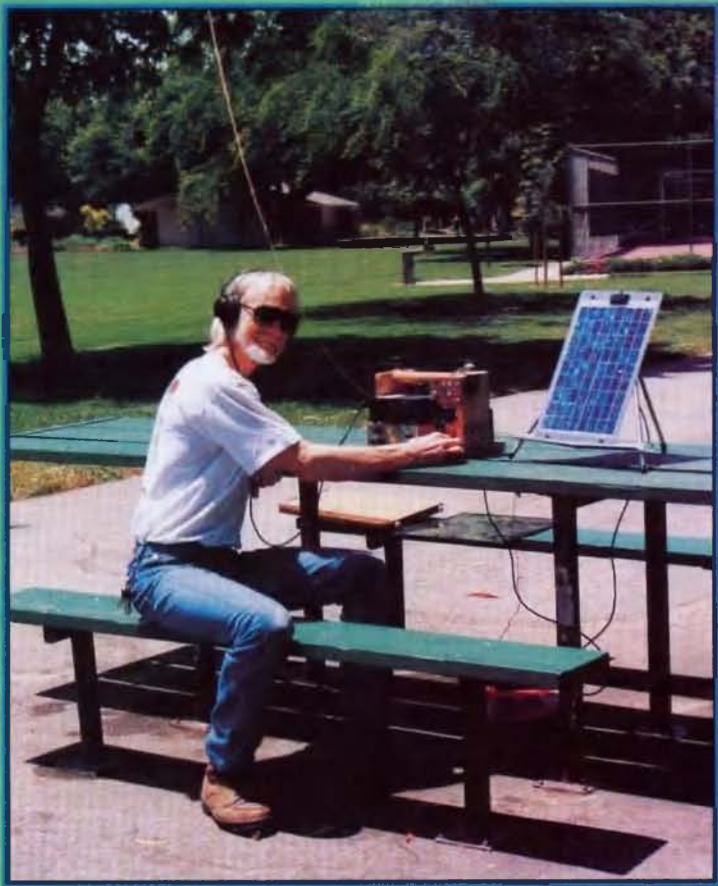

How about a talk in the park? — page 30

Review:

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AUGUST 1999
ISSUE #466

73® Amateur Radio Today

TABLE OF CONTENTS

FEATURES

DEPARTMENTS

REVIEW

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On the cover: Fun in the Sun article begins on page 30. We are always looking for interesting articles and cover photos — with or without each other. Your name could be in this space *next* month, and our check could be on its way to *you!* You couldn't use a little exra cash?

Feedback: Any circuit works better with feedback, so please take the time to report on how much you like, hate, or don't care one way or the other about the articles and columns in this issue. G = great!, O = okay, and U = ugh. The G's and O's will be continued. Enough U's and it's Silent Keysville. Hey, this is *your* communications medium, so don't just sit there scratching your...er...head. FYI: Feedback "number" is usually the page number on which the article or column starts.

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NEVER SAY DIE

Wayne Green W2NSD/1

Y2K, etc.

The controversy goes on—will it be a nuisance or a catastrophe? Most of the nuisance group seem to have oxen that are being gored by the problem, pushing them to put the best face on the situation. The disaster mongers seem to be those who have done the most research into the problem.

Art Bell W6OBB had me as a guest on his show in February and June (both shows were repeated later on "The Best of Art Bell") and we spent quite a bit of time discussing the situation. Art, who's had some of the leading experts on the situation on his show, is genuinely concerned, not just about what may happen come New Year's morning, but in what the potential for disaster may cause people to do which could create super-catastrophes.

For instance, more and more articles on Y2K recommend that, hey, just to be on the safe side, you'd better have some cash put aside. It wouldn't take much of an extra demand for cash to clean out the whole banking system. They're printing an extra $50 billion, but that isn't going to go far if the general public gets worried.

Then there's the food supply. If the power goes off, our cities will run out of food in an instant. I remember what happened on my submarine when the word went around that we were short of hot chocolate. Seconds later there was no hot chocolate. It had all gone into a couple of personal lockers. Any public belief that there may be a food problem will empty the stores in hours.

So Art's worried about what impact his discussions with experts on the problem may have. If the word gets around that ATMs may have to be shut down, there could be a rush. If people get concerned about the severe recession Y2K is predicted to trigger, there could be a stock market crash as people get the heck out of the stock market, looking to sell high and reinvest later when the market is in the dumpster.

By the way, the experts are sure enough of their worries that they've left the cities and moved to places like Arizona and New Mexico. Just in case, you know.

The situation has me looking over the suppliers of dome homes and solar power systems.

One thing is for sure, if the power grid does crash and stay down for any length of time, a ham station which can run from solar or wind power is going to be worth its weight in gold. As a result of our talk about Y2K and our further talk about the benefits of amateur radio, I've been getting an influx of *73* subscriptions from people who are anxious to get their tickets. Just in case. Well, if the ARRL directors flatly refuse to spend a dime to promote the hobby and try to turn around the plunging interest in it, I guess I'd better do what I can.

I do like the idea of a small survival community in our north forty, living in dome vacation homes. Just in case. So I'm reading *Roundup*, the journal of the Monolithic Dome Institute (Box 479, Italy TX 76651), and *Home Power* magazine (Box 520, Ashland OR 97520).

Y2K Testing

Maybe you saw the article in *BusinessWeek* about Y2K, saying it is going to be worse than anyone thought. But they were talking about the economic impact, not the social. Ed Yardini, the Y2K guru, keeps increasing the odds that the Y2K bug will create a world recession next year. He's up to 75% so far.

They cited the case of Samsonite, which spent over $10 million upgrading their computer system. When the system was done, and had been checked by 20 outside consultants as being all set to go, the president of the company flipped the switch to turn it on and nothing happened. The snafu lost them $10 million in sales and created enormous bad will with their customers. It froze their deliveries for 20 days, and messed up operations for months afterwards.

The moral is that finding and fixing the date-sensitive bugs in computer systems is only the first step. Then comes testing and fixing the undiscovered bugs, plus fixing the new bugs put into the system. And the cost of all this comes right off the bottom line since it doesn't add anything to sales. And that's going to depress earnings, followed by stock price drops. And, by the time you add this impact to several thousand large companies, you have a recession.

Last year McDonald's estimated their Y2K problem at $8 million. By December it was up to $30 million and climbing. AT&T has raised their estimate from $300 million to $900 million. Sears from $63 million to $143 million. And so it goes.

Now, supposing that, like the Samsonite test, these upgraded systems crash! That could bring the bears out of hibernation, not only affecting the stock market, but collapsing the house-of-cards power network. Or do you like the domino simile better?

Hmm, have you played dominos recently? It's a semi-no-brain game with chance as the larger element and thus relaxing. You should be playing games with your kids, you know. When's the last time you played gin with them? Michigan rummy? Or Russian Bank? Or cribbage? Do you get together with friends and play games? Like crazy eights? Liar dice? How about Monopoly? Or, if you really enjoy thinking, how about Boggle? That game was invented by a good New York friend of mine who used to go on sports car rallies with me before I moved to New Hampshire. He stayed there and got killed in a street shooting.

Y2K

One of the callers on the Art Bell show told about what happened after the Northridge earthquake, when the people got worried about food. He said that every store was completely empty within four hours. Y2K may be just a nuisance, but if it does fulfill the predictions of the worrywarts, how well are you and your family set up when it comes to having food to eat?

Another Y2K Tidbit

I see where Microsoft has discovered Y2K bugs in Windows 98 and is making an update on CD available. Macintosh computers, however, are Y2K compliant.

The chief Y2K researcher at Gartner Group, a tech think tank, says that 83% of current off-the-shelf software may have Y2K problems, down from 89% a year ago, Well,

Continued on page 55

QRX . . .

FCC on Y2K

The FCC recently released the Y2K Communications Sector Report. The report is an assessment of Broadcast Television and Radio, and says the public should continue to have access to critical news, emergency information, and entertainment services on January 1, 2000.

The report goes on to say that individual Y2K-related disruptions should be isolated. That Y2K problems are not likely to cripple cable system operations and it appears the vast majority of the nation's cable subscribers will continue to receive cable television service on January 1, 2000.

Y2K problems are unlikely to affect satellites now in orbit. But the report does indicate that isolated high frequency channel outages and some other limited problems may be encountered.

Copies of the report can be obtained on the FCC's Web site [www.fcc.gov]. The FCC's Year 2000 Task Force can be found at [www.fcc.gov/year2000].

Thanks to the FCC, via *Newsline*, Bill Pasternak WA6ITF, editor.

How They Hunt Elephants

Mathematicians hunt elephants in Africa by throwing out everything that is not an elephant, and keeping whatever is left.

Experienced mathematicians attempt to prove the existence of at least one unique elephant, before proceeding per above, as a subordinate exercise.

Professors of mathematics prove the existence of at least one unique elephant, then leave the detection and capture of an elephant as an exercise for the student.

Computer scientists hunt elephants by exercising the following algorithm:

1. Go to Cape Town, South Africa.
2. Work northward in an orderly manner, traversing the continent alternately east and west in a "raster-scan pattern."
3. During each traverse: (a) Catch each animal seen. (b) Compare each to a known elephant. (c) Stop when you detect a match.

Experienced computer programmers modify the algorithm, to ensure that the procedure will terminate, by first placing a known elephant in Ceuta.

Assembly language programmers prefer to execute the algorithm on their hands and knees.

Engineers hunt elephants by catching gray animals at random, and stopping only if one of them weighs within five percent of a previously observed elephant.

Economists don't hunt elephants. They insist that if elephants were paid enough, they would hunt themselves.

Statisticians hunt the first animal they see N times, and call it an elephant.

Consultants don't hunt elephants or anything else. But you can hire a consultant by the hour to advise you on how to hunt elephants.

Operations research consultants say they could correlate hat size and bullet color to elephant-hunting efficiency, if only someone would first identify the elephants.

Quality assurance inspectors ignore the elephants and look for mistakes hunters make packing their jeeps.

Politicians never hunt elephants themselves, but they will share the elephants you catch with the people who voted for them.

Lawyers don't hunt elephants either. Instead, they follow the herds and argue about who owns the droppings.

Software lawyers claim their clients own an entire herd, based on the look and feel of the droppings.

Vice presidents of engineering, research, and development try to hunt elephants, but their staffs have been set up to prevent success. When a vice president decides to hunt elephants, the staff finds ways to ensure that all possible elephants are "prehunted" before the vice president sees them. If the vice president chances upon a non-prehunted elephant, the staff (1) compliments the vice president's keen eyesight, and (2) enlarges itself to prevent any recurrence.

Senior managers set forth elephant-hunting policies based on the assumption that elephants are just field mice with deeper voices.

Salespeople don't hunt elephants. They sell elephants they haven't caught, for delivery two days before the season opens.

Software salespeople ship the first thing they catch and write up an invoice for an elephant.

Hardware salespeople catch rabbits, paint them gray, and sell them as "desktop elephants."

This piece, whose author is unknown, was submitted by Joel K9TBD, to the Delaware-Lehigh ARC "W3OK Corral"*—Clarence Snyder W3PYF, editor. It appeared in the April 1996 issue, according to the November 1996 issue of the* ARNS Bulletin.

Good Morning, Kosovo!

The war against Yugoslav strongman Slovidan Milosovic was waged in the air and also on the airwaves. As bombs and cruise missiles tore apart the Serbian infrastructure, NATO began a campaign of direct broadcasting to the Serbs.

Q-News' *Graham Kemp VK4BB explained:*

The United States sent two aircraft—transmitting radio and television messages over normal broadcast frequencies—to the area of the Serbian crisis. According to Glenn Hauser's Short Wave DX *report, two "Commando Solo" aircraft of the 193rd Special Operations Wing left the USA for the Balkans at the end of March.*

The RSGB news service reported that the two planes flew at around 20,000 feet and broadcast on 1003 kHz medium wave, and 87.9 MHz VHF, around the clock, to Serbia and Kosovo. The significance of these two frequencies was that 1003 kHz lay between the regular channels of 999 kHz and 1008 kHz, which both carry Serbian programs from Belgrade. The 87.9 MHz frequency was within 200 kHz of local broadcasts in Novi Sad.

Adapted from *Newsline*, Bill Pasternak WA6ITF, editor, with thanks to *Q-News*.

An Internal Government Memo on Y2K

Dear (Name):

Our staff has completed the 18 months of work on time and on budget. We have gone through every line of code in every program in every system.

We have analyzed all databases, all data files, including backups and historic archives, and modified all data to reflect the change. We are proud to report that we have completed the "Y-to-K" date change mission, and have now implemented all changes to all programs and all data to reflect your new standards: Januark, Februark, March, April, Mak, June, Julk, August, September, October, November, December. As well as: Sundak, Mondak, Tuesdak, Wednesdak, Thursdak, Fridak, Saturdak.

I trust that this is satisfactory, because to be honest, none of this "Y-to-K" problem has made any sense to me. But I understand it is a global problem, and our team is glad to help in any way possible. And what does the year 2000 have to do with it? Speaking of which, what do you think we ought to do next year when the two- digit year rolls over from 99 to 00? We'll await your direction.

Seen in the March 1999 B.A.R.C.'s Bark *(from an unknown source via the Internet).*

Three Types of Hams?

I have come to the conclusion that there are three different types of hams.

1. The "disgruntled" ham.

This type of ham is easy to find. He is bitter, for some unknown reason, and does nothing to help out the amateur community. What he does is complain a lot, get angry, yell and/or cuss, and in general be a pain in the behind. He does not care about amateur radio—just himself. Kind of depressing when you think about it.

2. The ham who wants help and/or is "new" to amateur radio. Now, this ham could end up like

Continued on page 54

Number 10 on your Feedback card

PIC-based DTMF Project

Build this decoder and learn.

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Recently I was looking through some back issues of some electronics magazines I have and ran across a design for a DTMF tone decoder. It was a good design for its time, but while reading the article, I couldn't help thinking that using today's technology, the circuit could be greatly simplified. It wasn't long before I had the engineering notebook out and was working on an improved design. The result is presented here.

Circuit description

A block diagram of the original circuit is shown in **Fig. 1.** The blocks correspond to the DTMF receiver, decoding circuitry, and 8-digit display of the original circuit.

The decoding circuitry was by far the most complicated portion of the original circuit. It was required to sense when a valid tone was received, decode it, and shift the corresponding digit into the display. To do this, the original circuit used fourteen TTL chips, eight of which were used to simply hold the decoded digits for display.

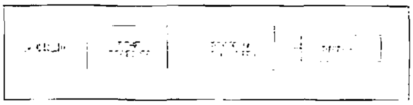

Fig. 1. DTMF decoder block diagram.

Fig. 2 shows the schematic for the updated circuit. Like the original, an integrated DTMF receiver is used, but the fourteen chips used to decode and display the received tones have been replaced by a single PIC microcontroller. In addition, the display, which previously used 7-segment LEDs, has been replaced with a 16x1 LCD display. The resulting circuit is simpler and displays sixteen digits instead of the original eight.

Circuit operation is quite simple. Audio containing the DTMF tones is fed to pin 7 of U2, a Motorola 145436 DTMF receiver. When a valid pair of tones is detected, pin 12 of U2 goes high. This is detected by U1, a PIC 16C84, which reads the code corresponding to the detected tones from U2, converts it to an ASCII character, and shows it on the LCD display. The display shows the last sixteen received codes. Once the display is full, reception of another tone pair causes the displayed codes to be shifted to the left and the new code is displayed on the far right. Pressing switch S1 clears the display, preparing it to receive a new set of tones.

You may notice that U2 and the LCD display are both controlled by the same 8-bit port. This is possible since the outputs of both the LCD display and the DTMF receiver are in a high impedance state until they are addressed. By enabling the LCD or DTMF receiver only when they are being read or written to, the two are able to share a single 8-bit port.

Circuit construction and testing

Before building the decoder, you will have to program a 16C84 with the decoder software. Blank 16C84s are

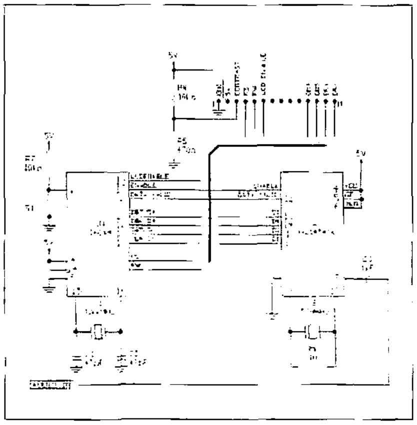

Fig. 2. DTMF decoder schematic.

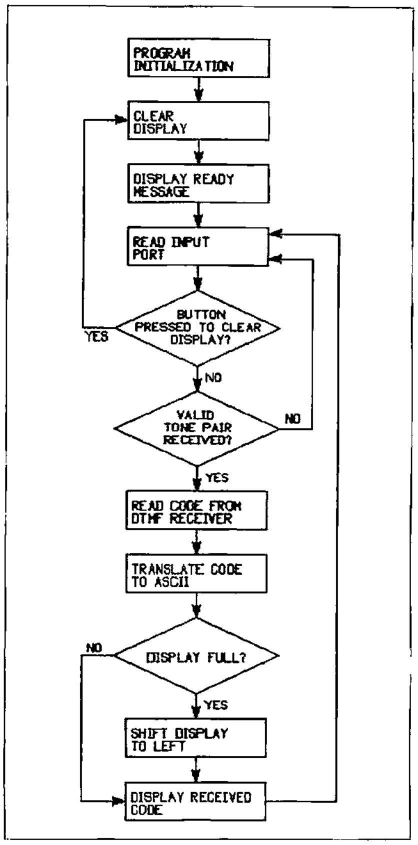

Fig. 3. Software flow diagram.

available from a number of distributors. The decoder software can be downloaded from my Web site at [http://homepages.go.com/~joseph264].

Because of the low frequencies and the small number of chips involved, you shouldn't have any trouble putting the circuit together. The original was built using wire-wrap on a Radio Shack protoboard. Point-to-point wiring should work just as well. Just follow the schematic and remember the normal precautions about keeping lead lengths as short as possible.

One thing needs to be mentioned about the LCD display. The display I used had a physical configuration of one row with 16 columns, but was configured internally as two rows of eight columns. Therefore, the software was written to expect this display configuration. If your display is configured differently, you will have to either try a different display or modify the software to display the decoded digits on a single row. Also, the display connector shown on the schematic consists of a

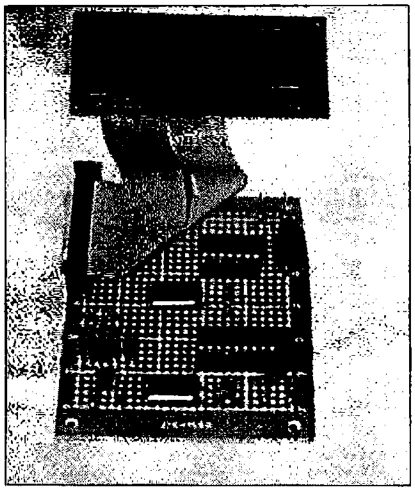

Photo A. DTMF decoder circuit.

single line of 14 pins. You may have to use a different connector depending upon the type of display you use.

To test the decoder you will need a source of DTMF tones. For my own testing, I used a cordless telephone and a scanner. This works because a cordless phone will put out a signal when you press the talk button even if it is not connected to a phone jack.

To use this technique, disconnect the phone from the wall jack and press the talk button. Put the scanner in search mode and locate the frequency being used by the phone's base unit. To confirm you have the correct frequency, press a couple of keys on the hand-held unit. You should hear the tones coming from the scanner's speaker.

Connect the audio output of the scanner to the input of the decoder. Attach a source of 5 volts to the decoder and turn it on. As you press the keys on the phone's hand-held unit, you should see the corresponding digits on the decoder's display. If you don't see anything, try turning up the volume on the scanner. If you still don't see anything, go back and check the decoder's wiring. One good way to do this is to get a copy of the schematic and use a highlighter to mark off all the connections as you check them. It may sound tedious, but I spent quite a bit of time tracking down a problem with one of my original circuits that turned out to be the crystal not being connected correctly. If I had made the effort to use this technique, it would have saved me a lot of time.

Circuit modifications

As shown, the decoder is intended to connect to a radio's headphone jack. If you wish to use it with a low level audio source (e.g., a microphone), you may have to provide an amplifier.

This circuit and its software could also be used as the basis of a DTMF remote control circuit. This would require replacing the software routines used to control the display with one that writes the appropriate control words to the 16C84's port. This is, as they say, left as an exercise for the interested reader.

Should you decide to build this circuit, I hope you find it as interesting as I did. I still find it amazing how much a single 16C84 can do, especially with a little judicious programming. And the best part is, if you don't like the way the circuit works, you can always change the software. Beats rewiring and swapping TTL chips any day.

Parts List

Designation	Part
C1, C2	47 pF NPO disc capacitor
C3	1 µF nonpolarized electrolytic capacitor
R4, R7	10 k 1/4 W resistor
R5	470 ohm 1/4 W resistor
R6	1 meg 1/4 W resistor
X1	3.68 MHz xtal
X2	3.579 MHz xtal
U1	PIC 16C84 microcontroller (18-pin DIP package). If you are unable to locate a PIC 16C84, a PIC 16F84 can be used instead.
U2	MC145436 DTMF receiver (14-pin package). Available from JDR Microdevices [http://www.jdr.com].
S1	Normally open, momentarily closed switch
LCD	16x1 LCD display. Available from Marlin P. Jones and Associates [http://www.mpja.com].

Table 1. DTMF receiver parts list.

How to Turn a Deaf Ear

... with your antenna.

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Australia

A short while ago, I was approached by a friend with a problem. It appears that he was suffering from an interfering signal, on one frequency, from a specific direction. "Could I," he asked, "suggest an antenna with good rejection in one direction but a broad polar response otherwise?"

Dropping this in my lap, he sauntered away with a smile—or was it a smirk?—on his face.

Before going into detail of what finally emerged, let me stir your memory regarding transmission lines. One useful feature of a quarter-wavelength transmission line, or odd multiples thereof, is its ability to transform impedance. Thus a low impedance at one end of a quarter-wavelength becomes a high impedance at the other end, the transformation ratio depending on the impedance of the line.

The following equation allows the calculation of the resulting impedance when the initial impedance and the line impedance are known.

$$Z_r = \frac{Z_l^2}{Z_i}$$

where Z_l = line impedance, Z_i = low impedance at one end of the quarter-wave line, and Z_r = impedance seen at the other end of the line.

Substituting in the equation above, we see that if the low input impedance is 50 ohms and the line impedance 300 ohms, then an impedance of 1800 ohms will be apparent at the high impedance end of the quarter-wave transmission line. If you don't believe me, get your kid to work this with his calculator.

Well, that's the worst part. Now all we need to do is a simple application of Ohm's Law. Assuming pure resistance, then the equation of $R_t = 1/(1/R_1 + 1/R_2)$ can be applied successfully.

Substituting 50 ohms and the value of 1800 ohms, calculated above, the total resistance would be 48.648 ohms. This is so little different from 50 ohms that it could be neglected when being fed with 50-ohm coaxial cable from a transmitter.

So what?! What has this to do with directional antennas? The answer is, quite a lot when combining driven elements in an antenna!

In referring to my library of antenna publications, I found that it looked like phasing two half-wave antennas to produce a cardioid-like pattern would solve my friend's problem. With a spacing of one-quarter wavelength and a phasing of 90 degrees (one-quarter wavelength) or 270 degrees (three-quarters wavelength), the desired pattern may be achieved. Assuming a set direction of null, the feedpoint would have to be changed from one half-wave dipole to the other depending on whether the transmission line (phasing line) was one-quarter or three-quarters wavelength.

My wife will tell you that I am a born skeptic, so I chose a boom one wavelength long and centered the two driven elements on the boom. This left three eighths of a wavelength on each end of the boom for experimentation. Also, being naturally lazy, and suffering from arthritis, I then instructed my friend to build the antenna and test it at his location. Using a one-inch boom and three-eighths-of-an-inch tubing, my friend proceeded with his task. The insulators were good-condition TV ones, the securing screws three-sixteenths-inch stainless steel.

When erected on a rotator, the antenna had its pattern measured; it was found to be as theory suggested, but the null was insufficient for his problem signal. The next step was to install a reflector element a fifth of a wave-

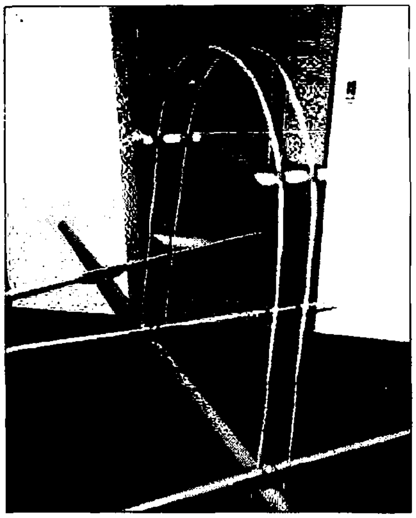

Photo A. The prototype hooped it up pretty well.

length behind one of the driven elements. To maintain symmetry, it was also mounted on a TV insulator, with an aluminum strip joining both halves in the center. On testing the pattern, the rear rejection was greatly improved and sufficient to solve the interference problem. However, the front lobe now exhibited a small dip.

While the antenna was satisfactory in operation as far as my friend was concerned, I stubbornly wanted to add the final touch to the antenna. After considering a parasitic director and a driven element, I chose the latter with the hope that it might give a broader frequency response. This meant that a driven element of the same size was added a quarter of a wavelength in front of the other two.

On test, the side response dropped and the front response increased while exhibiting a deep rejection to the rear. The small lengths of boom material were trimmed purely for aesthetic reasons. In the original test antenna (**Fig. 1**), a three-quarter-wavelength line was used between the two original driven elements, with the feedline connected to the dipole farthest from the reflector. The third driven element was connected to the feedpoint with a quarter-wavelength line, thus retaining the feedpoint on the central dipole. The phasing line was 3 mm-diameter solid aluminum spaced approximately 26 mm apart center to center. This was to suit the driven element center spacing of the stainless steel screws.

The three-quarter-wavelength line needs to have the slack of a half-wavelength taken up. In **Photo A**, you can see that the prototype uses a "hoop" between the driven elements. After the photo was taken, a plastic support was fastened between the boom and the center of the "hoop." The practical side of this arrangement left something to be desired. Another way to achieve 270-degree phasing is to use a quarter wavelength (90 degrees) and cross the feeder (180 degrees). The final antenna used this method (**Fig. 2**) and proved quite satisfactory in performance. Note that the quarter-wave spacing should be retained, but because of the crossed feed, the harness will be slightly longer than a quarter wavelength.

The SWR was quite low on the antenna. Remember, theoretically the resistive impedance for two elements was 48.65 ohms, suggesting a possible SWR of 1.03:1. Adding the third driven element would lower this to 47.37 and produce an SWR of 1.05:1.

Continued on page 29

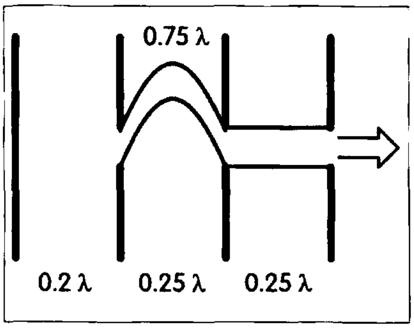

Fig. 1. Original test antenna.

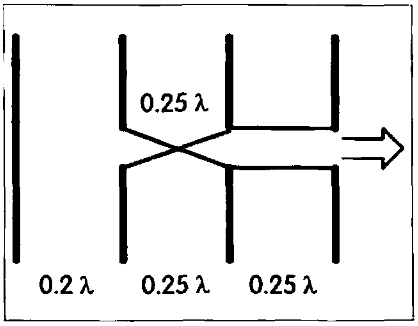

Fig. 2. Final version.

Secrets of Transmission Lines

Part 1: Intro and dummy load project.

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Pittsford NY 14534

Considered as a group, radio hams are a fairly inquisitive bunch, interested in a variety of things. There are a large number of subgroups within the fraternity. Some are interested in the competitive aspects and fight for the DXCC awards, and others are avid contesters. Some are simply rag-chewers who like to get together with cronies on a net and discuss nearly any topic. Some are tinkerers who have to try the newest in slow scan or live TV or whatever. A few are hardware developers who build new and different equipment.

One thing is a bit surprising. Considering the technical nature of the hobby, the percentage of electrical engineers is relatively small. Ham radio attracts people from all walks of life. We all have to pass theory tests to obtain our licenses, but for most this consists of buying a "question and answer" study book aimed at a particular library or pool of questions. It can be argued that this approach does not necessarily impart a fundamental knowledge of the topics.

This series is intended for those who would like to go a little further down the technical road. The object and style of the writing is aimed at imparting a fundamental understanding of transmission lines, impedance matching, and the Smith chart without necessarily using a lot of high powered mathematics. Each topic will be portrayed with easily repeated physical experiments to be performed with stuff to be found around most ham shacks. In some cases, computer-generated art will be used to illustrate the point. The intent is to promote fundamental understanding rather than mathematical rigor.

Contents of the series

The series will be broken down into the following blocks:

1. Review of DC fundamentals.
2. Review of AC fundamentals.
3. Fundamentals of transmission lines.
4. AC steady state transmission lines.
5. The Smith chart.
6. Impedance matching.

The review of DC and AC fundamentals is included because some grasp of these topics is essential to any understanding of the operation of transmission lines and the subject of impedance matching. Wherever possible, a physically visualizable example, experiment, or illustration is presented.

While we have noted that high-powered math is avoided, some math is necessary, and some knowledge of high-school-level trigonometry and algebra is helpful. Most of the experiments intended to illustrate the point can be performed with readily available hardware items, a multimeter, a two meter handheld transmitter, some junk box parts, and some spare coax cable. A calculator with trigonometric functions is helpful but not mandatory.

Let's see how we can get started on this venture.

DC fundamentals

In this section, we shall consider only continuous direct currents such as one might obtain from a flashlight battery and solid wires and resistors. Turn on and turn off are not considered. As a beginning, and for our purposes here, the most significant part of understanding DC circuits is described by Ohm's law, named after George Simon Ohm. In words, it states that the current flowing in a circuit is proportional to the voltage forcing the current divided by the circuit resistance.

For a physical analogy, consider the illustration in **Fig. 1(a)**. We have a

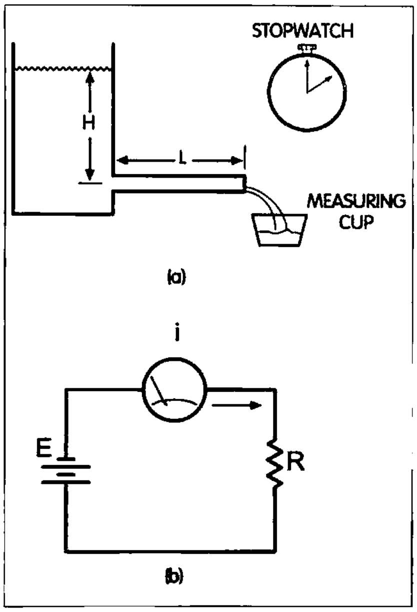

Fig. 1. (a) Ohm's law analogy. (b) Ohm's law in a circuit.

(1-1) $$\frac{E}{R} = i$$

(1-2) $$\frac{\text{volts}}{\text{ohms}} = \text{amperes}$$

container filled with water, a soda straw attached to let the water out, and a container to catch the water. The height of the water above the soda straw (H) is analogous to the battery voltage (E) in **Fig. 1**(b). The length of the soda straw (L) is analogous to the resistance (R) in the electrical circuit. With the measuring cup and the stopwatch we can measure the time it takes to fill the cup, thus giving us the water flow in gallons per minute (or cubic centimeters per second), which is more or less analogous to a measurement by the ammeter in the electrical circuit. If we shorten the soda straw to half the original length, the flow will double. Similarly, if we halve the resistance in ohms, the current will double. We don't want to carry this analogy too far, because there are differences between the way water flows through a pipe and electricity flows in a wire, but as far as it goes, the analogy is satisfactory.

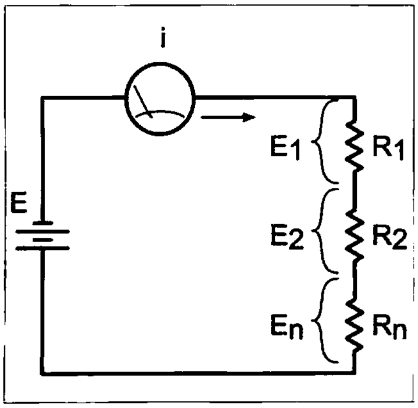

Fig. 2. Series circuits.

(1-3) $$E = E_1 + E_2 + \cdots E_n$$

(1-4) $$E = iR_1 + iR_2 + \cdots iR_n$$

(1-5) $$\frac{E}{R_1 + R_2 + \cdots R_n} = i$$

Power

To understand the quantity power, we must differentiate it from the physical concept of work. Work is defined mechanically as the product of force and distance. Power is defined as the time rate of doing work. If you lift a 5 pound weight two feet, you have done 5 x 2 = 10 foot pounds of work. To calculate power, we must know the time it took to do that work.

When James Watt started selling steam engines to mine owners for pumping water out of mines, he had to come up with some way of describing the work the machine would do. He found that the Welch ponies walking on a circular track driving the pumping machine could average 550 foot pounds per second, so this value was adopted for the "horsepower." How do we relate this to electrical work?

In **Fig. 1**, the analogy for the ampere was chosen to represent a flow rate

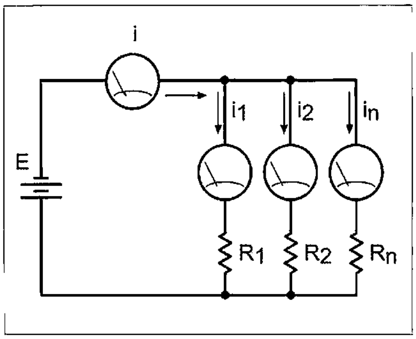

Fig. 3. Parallel or shunt circuits.

(1-6) $i = i_1 + i_2 + \cdots i_n$

(1-7) $i_1 = \frac{E}{R_1} \quad i_2 = \frac{E}{R_2} \quad i_n = \frac{E}{R_n}$

(1-8) Now let $G_n = \frac{1}{R_n}$

(1-9) Then, $i = EG_1 + EG_2 + \cdots EG_n$

(1-10) $i = E(G_1 + G_2 + \cdots G_n)$

versus time. The ampere is actually a time rate unit. An ampere is defined as an electric flow rate of one coulomb per second, which corresponds to 6.25 x 10^{18} electrons per second. A fantastically large number! The product of the force in volts times flow in coulombs per second is power. Thus force in volts times current in amperes is watts. 746 watts equal one horsepower.

Substitution for E or I from Ohm's law also gives useful relationships for power.

$P(\text{watts}) = E \times i = i^2 \times R = E^2 / R$

Depending upon the situation, one of these may be more useful than others.

Kirchhoff's law

Kirchhoff's law states that the algebraic sum of the currents at a junction is zero; in other words, the number of electrons leaving the junction must equal the number entering it.

This is fairly easy to visualize. Suppose that we have the intersection of three streets, each ending at the intersection. If one of the streets is one way inbound and the other two are one way outbound, then the sum of the cars on the two outbound streets must equal the number of cars on the inbound street. If it were less, cars would accumulate at the junction, and if it were more we would have to create new cars at the junction.

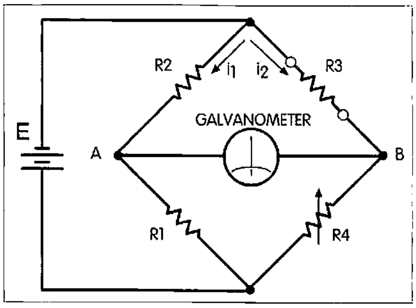

Fig. 4. The Wheatstone bridge. If $R_1 = R_2$ and $R_3 = R_4$, voltage A = B and no current flows in galvanometer. Also true if $R_1/R_2 = R_3/R_4$.

Combining loads

When there is more than one resistance in a circuit, the values must be combined in some fashion to solve the circuit. In **Fig. 2**, we see a series-connected circuit consisting of resistances R1, R2 ... to Rn. In this circuit, the current i passes through all of the resistors. In this case, the sum of the voltage drops across the resistors would equal the battery voltage, and it is possible to simply add up the resistances and divide the battery voltage by the sum.

With the parallel or shunt circuit, we see that the input voltage E is present across all of the resistors and we must add the currents to satisfy Kirchhoff's law (see Eqn 1–6). Now the individual currents are given by the equations in 1–7. If we make the substitution of Eqn 1–8, we can rewrite Eqn 1–6 as Eqn 1–9, and, factoring out the E, we obtain Eqn 1–10.

The substitution of Eqn 1–8 translates from resistance into conductance. The units of G are in conductance given in either mho in older texts or siemens in newer texts. A resistance of 1 ohm is equal to a conductance of one siemens. A resistance of 10 ohms would be equivalent to a conductance of 0.1 siemens. When working with parallel or current combining circuits, it is more convenient to work in conductance.

In terms of conductance in mho:

$P(\text{watts}) = E^2 \times G = i^2 / G$

The Wheatstone bridge

The Wheatstone bridge is a very practical circuit that finds use in many places and is particularly helpful in impedance matching instrumentation. It is shown here mainly because it represents a basic balanced circuit representative of many RF and transmission line measuring systems. It may be seen that if R1 = R2, point A is at a potential equal to E/2. If R3 = R4, the same is true for point B and no current will flow in the galvanometer (which is simply a very sensitive zero center ammeter). Voltages A and B will also equal the ratio between R1 and R2, which equals the ratio between R3 and R4. In some transmission line instruments R1 = R2 = R3 = 50 ohms. In this case, the bridge will null when the transmission line, substituted for R4, is 50 ohms. This gets a tad ahead of the text, but it represents an important case in which the VSWR is 1.0:1.

A practical example

For a practical example, we will look at the design and construction of a dummy load or dummy antenna which we shall use later in the program. This is something you should have around the ham shack anyway. Since the resistors are going to be paralleled, we will work in conductance.

To begin with, we would like to have the unit handle the output of a conventional transceiver. With a nominal 100 watt transceiver, a 50 watt load is usually adequate for most measurements, since the transceiver is usually not capable of long-term key-down output in excess of 50 watts average. We can get a rating like this by paralleling about 25 resistors with 2 watt ratings. Note that an RF dummy load cannot be built using wirewound resistors—even so-called non-inductive ones. Carbon composition or metal film types are suitable to 30 or 50 MHz.

The illustration of **Fig. 5** shows the general construction. A "cordwood"-type construction is used. Two pieces of 1/16-inch printed circuit board, preferably the fiberglass type, are cut and drilled with a regular drill plan on 0.5-inch centers. The boards may be stacked, foil side out, and drilled simultaneously. The selected resistors are a little less than 3/16 of an inch in diameter, so there is plenty of air space between them. This is important for cooling.

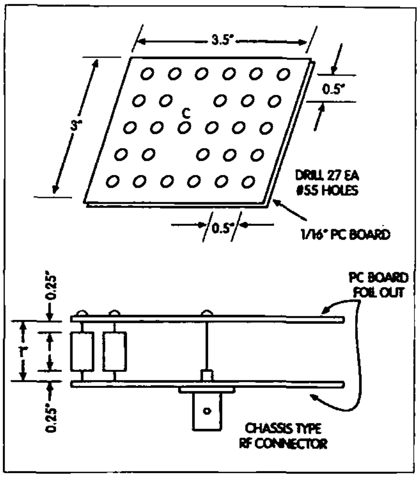

Fig. 5. Dummy load project. Resistors are 2 watt metal oxide 5%, 1200 Ω nominal, Tech America #900-0820.

After the small holes are drilled, enlarge the hole marked C in the drawing on one plate only to accept the chassis-type connector you intend to use. A BNC is shown, but you could just as easily use a UHF or type N. Make sure that a 50 ohm connector is used. Mount the connector and solder a lead in its center conductor about 1.25 inches long. You will note that 27 holes are called for and one is occupied by the center conductor.

The target resistance for the dummy load is 50 ohms or 0.02 mho. With nominal 1200 ohm resistors at 5% tolerance, the actual resistance of any resistor could lie between 1140 ohms and 1260 ohms, or between 8.77^{-4} mho and 7.94^{-4} mho. Dividing 0.02 by these numbers tells us that we need between 22.8 and 25.2 resistors respectively. Unless a check with a good digital ohmmeter shows that they are running consistently low in resistance, I would load 25 resistors into the unit.

Load all of the resistors onto the board with the connector. Hold the board with the connector side down. Next, clip the upper end of each resistor lead about a half inch above the resistor end. Clamp the upper board one inch above the connector carrying board. You may have to make some spacers for this. Next, steer the leads one at a time through the appropriate holes in the upper board. Working from the center out, slide the resistors in one at a time. When they have the resistor body 1/4 inch below the underside of the top board, solder the lead in place. Clip off the excess lead protruding from the top. Avoid soldering any leads on the bottom board until all resistors are soldered on the top board.

After soldering the last resistor on the top board, turn the assembly over and solder each resistor on the board with the input fitting. Clip the leads after soldering.

You now have a relatively sturdy "cordwood" assembly. Measure the resistance across the input connector. If it is less than 50 ohms, you can correct it by clipping one or more resistors. Suppose that the resistance measures 48 ohms or 0.0208 mho. At 1200 ohms, each resistor represents 8.33^{-4} mho, so clipping out a single resistor should bring the conductance to 0.01967 mho or 50.08 ohms.

On the other hand, if the resistance is too high, say 51 ohms, you can add another resistor in one of the vacant holes.

Actually, the 51 ohms would probably be acceptable. However, let's examine what would be required to correct it.

51 ohms = 0.0196 mho, so 0.004 mho would bring the unit to 0.02 mho. However, let's be careful here. For 50 watts dissipated in 0.02 mho, the voltage is :

$P = E^2 x G$

$50/0.02 = E^2$

$E = 50 V$

and in the 0.004 mho correcting resistor:

$P = 50 x 50 x 0.004 = 10$ watts

For a safe rating, you would like to make up the 0.004 mho with 5 each 2 watt resistors, so each should have a conductance of 0.004/5 = 0.0008 mho. You would need 5 each 1250 ohm resistors to make up the error.

Conclusion

The next section will deal with alternating current fundamentals, where we will look at some of the differences between AC and DC.

Kiwi SSTV

How they do it in ZL-land.

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The picture on my computer screen was slanted, but quite recognizable. "I did not get it at all," said the guy on 14.230 MHz, for whom it was intended. I stuck my oar in, and bragged about my reception. "Send us a picture of your own then," said Keith VK2JY. I did, and that was it. I was on slow-scan television. This is him in **Photo A**, in the picture he sent on that first QSO.

"What is slow-scan television?" neighbors and friends ask me. The name suggests it — it's about sending and receiving pictures slowly.

Sending non-digitized pictures 60 times a second typically takes 5 megahertz of bandwidth even when cutting corners. That is more than 14 times the width of the 20m ham band. Fast-scan TV, therefore, is found here in New Zealand on the 70cm and 23cm bands.

To exchange pictures on the HF bands, you have to slow down transmission and reception, to make them fit inside a voice channel.

Early SSTV relied on long-persistence cathode ray tubes. The beam on an oscilloscope would wander slowly down the tube face, and you watched the after-glow. To transmit, brightness variation modulated an audio tone. Modulated audio is still the method used now.

After the low-glow came scan converters using digital shift registers. The audio tones were converted to numbers (analog-to-digital conversion), which were scanned into the shift register.

Photo A. *VK2JY and XYL.*

Photo B. *And now a word from Bronc and John ...*

Photo C. A shot from MIR.

The shift registers were then scanned at a rate fast enough for an ordinary TV. Later, separate memory did away with having to tape images just for instant replay.

Commercial scan converters available in the US were the Robot-Research series. Britain had "Wraase-Elektronik" gear. These introduced transmission standards still supported. *The Slow Scan Companion* (1987) by the British Amateur Television Club mentions other makes as well.

Scan converters were also available as kits. Still in use down here is the LM-9000, which was a technical education project by John VK3LM. That is him on the right in **Photo B**.

Also in the '80s, scan converter emulator programs became available for microcomputers. The Commodore VIC20 and C64 had a receive-only program. I used a Sinclair Spectrum for reception only, though it allowed transmission as well, and it did not need an external interface. These 8-bit machines were limited by lack of memory and slow speed when compared with dedicated scan converters. I could receive in black and white only, and noise

Continued on page 22

Photo D. *KF7OH sent this along.*

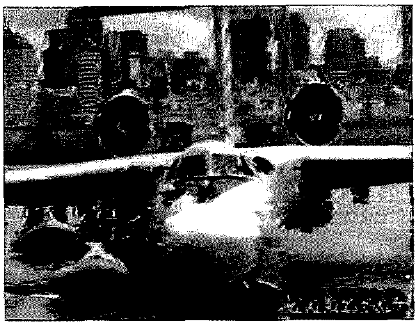

Photo E. ZL1BKG floated this image.

from the computer and the TV monitor required strong signals on reception.

It was for scan converters that the first transmissions standards were created. Robot-36 uses a black and white image with a color component added, which made it compatible with black and white modes in use at the time. This is the mode used on the *MIR* space station, on 145.985 MHz during weekends.

Photo C was received from *MIR* by ZL3WWW. I have also seen great *MIR* pictures obtained by ZL2CX.

When I used my Sinclair Spectrum, color pictures were also sent as three separations, one after the other — red, green, and blue. They proved incompatible with the SSTV modes that followed, Scottie-1 and Martin-1. These have a resolution of 320 x 256 pixels, and sent red, green, and blue line by line, taking about 2 minutes to transmit. Both modes were supplied in ROMs for scan converters.

A bitter war was fought between their originators over which version proved more immune to interference and changes of propagation. Scottie-1 is favored in the US and down here,

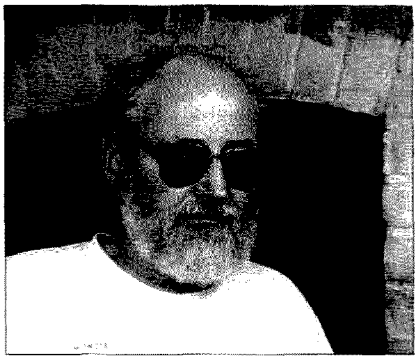

Photo F. The author before ...

and Martin-1 in Europe. The Japanese play it both ways. The main difference seems to be that one scans from left to right, the other from right to left.

320 x 256 pixel resolution is also used at double the speed with Scottie-2 and Martin-2 in good HF conditions. For bad conditions, times are extended with Scottie-DX, SC-180, and WR-180.

On **Photo D**, a picture from Rob KF7OH, the mode WR-180 limited the blurring I usually get from the US. Blurring occurs with multipath reception. I used an editing facility to get rid of the worst noise lines.

There are now resolutions of 640 x 496 available, suitable for VHF and UHF.

Later scan converters were microprocessor-controlled, and allow other modes, if you could get the ROM for them. They work with a camera, and some generate text. **Photo E** is an example sent by Trevor ZL1BKG from his LM-9000 scan converter.

Scan converters required a lot of money, and time, and considerable expertise. With home computers becoming faster, and equipped with video cards and sound cards, the whole job can now be done more easily.

Most programs inevitably are for IBM clones. Some need a simple interface plugged into the serial port, described in the program. The serial port should employ a standard Universal Adapter for Reception and Transmission chip (UART). The serial port is used as an A-D, D-A converter (analog/digital). The interface has an op amp boosting the audio voltage to RS-232 levels for reception, and a low-pass filter for smoothing the audio out of the serial port. Such programs generally work under DOS. EZSSTV is the preferred free program of that type down here, because it supports Robot-36 from *MIR*. Pasokon is the paid-for version, to be preferred if you don't want to be limited to Robot-36, Scottie-1, and Martin-1.

All the Windows programs I have seen and heard of use the sound card for A-D and D-A conversion. They should be Sound Blaster compatible. Laptops may offend on that one. JVComm and ChromaPix I see mentioned most often, but there are lots of others.

Photo G. ... and after retransmission.

A good place to start looking for information and programs is on the Internet, at [http://www.ultranet.com/~sstv].

There are small hurdles: Picture reception has to be synchronized with transmission, to get the verticals straight and the colors in the right place. All formats have sync pulses at the beginning of each line. Noise pulses then can cause synchronization to be lost. For that reason, all programs I know of look for an identifier for the mode, then use the computer clock for maintaining picture synchronization. They only look for the first sync pulse when starting picture reception manually.

EZSSTV asks you to receive several pictures so that it can adjust itself to the computer clock, but most programs ask you to adjust manually, by straightening the verticals of a picture received.

Sound card users I have listened to had a problem finding a matching audio level from their transceiver. I use a Yaesu FT-847 and a Kenwood TS-570S into the Hamcomm interface.

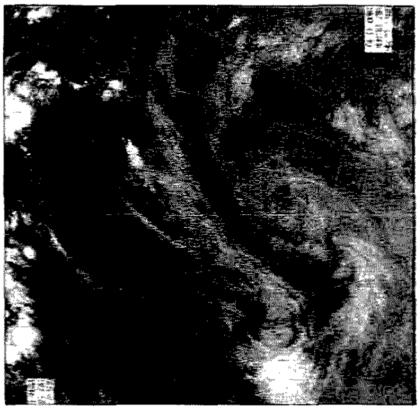

Photo H. And there's always time for WEFAX ...

Photo I. ... and SSTV "art."

Both have sockets at the back providing audio levels suitable for data, which work for SSTV as well. With older equipment you may have to dive into the set to find a suitable level.

But why use SSTV in the first place, when you can stick your pictures as attachments into your E-mail? For me, E-mail cannot match the immediacy of SSTV. Even a noisy reception from *MIR* (because I use an omnidirectional antenna and a hybrid computer, and a program that does not support Robot-36) tells me "This is what *MIR* is seeing now!"

On an off-center-fed dipole for an HF antenna, I still catch European stuff regularly. Mario IØJMH retransmitted one of my pictures (**Photo F**) from Rome in Italy, and I could still recognize it (**Photo G**).

If you own a digital camera, then SSTV is a great outlet for your creativity. I have forwarded my photos of a 23cm ATV project, the same day I had taken them, on VHF using SSTV.

My program also supports Weather Fax. This morning, I received from Tokyo this satellite image (**Photo H**), transmitted on 13.595 MHz. Image broadcasts are at 7.10 and 19.10 UTC.

Some international SSTV frequencies are 14.230, 21.340, and 28.680 MHz. On 20m, the four hours around twilight are most promising in spring and autumn. If you haven't already, you ought to try SSTV — you never know what you might find (**Photo I**)! 73

All About Op Amps

And then some.

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The Philbrick amplifier was the first commercially available general purpose op amp. It found application in the analog computers of the time and started a revolution. But the days of the analog computer are fading, and the need for the Philbrick amplifier is long gone. In place of the Philbrick are a myriad of monolithic IC op amps in which transistors have taken the place of the 12AX7 dual triode. There are many flavors of op amps, but all have features in common: They are intended to operate with negative feedback. The feedback network determines the operation to be performed.

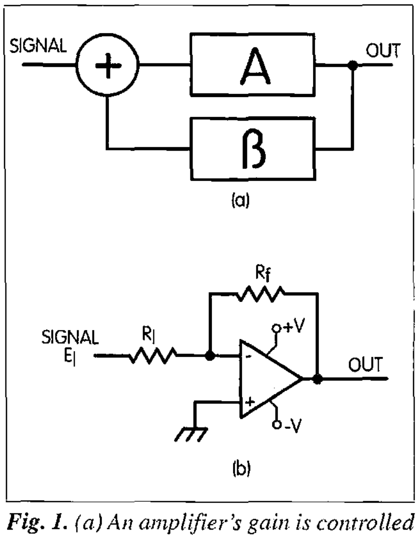

Fig. 1. (a) An amplifier's gain is controlled with feedback. (b) A generic IC op amp is a gain block.

An operational amplifier, or op amp, gets its name from its ability to perform a mathematical operation. The operation may be as simple as providing gain or as complex as filtering a signal. All of these amazing things derive from the feedback applied around the amp shown in **Fig. 1(a)**.

The negative feedback system shown is composed of an amplifier with gain A whose effective input is the signal summed with a portion Aß of the output that is fed back. The gain of the amplifier with feedback can be expressed as:

$$A_f = A/(1 - A\beta)$$

where

A_f is the gain with feedback

A is the gain without feedback

ß is that portion of the output fed back to the input.

When A is very large and negative, $1/(1 - A\beta) \approx 1/-A\beta$, and $A_f \approx -A/-A\beta \approx 1/\beta$. A_f is essentially independent of A. Since ß is made up of passive components, A_f is essentially constant.

Obtaining a large gain usually requires several stages of amplification, and applying feedback around a multi-stage amplifier is not a simple process. At some frequency, the gain of any amplifier begins to fall, accompanied by an increase in lagging phase shift.

The phase shift will be -90 degrees at some high frequency for each stage in the amplifier. When the amplifier is made up of more than a single stage, the phase shift will be -180 degrees at some frequency, and the negative feedback changes to positive. Positive feedback leads to the possibility of oscillation.

To avoid positive feedback around a multi-stage amplifier requires control of the phase shift through the amplifier. Lead/lag networks within the amplifier make the phase shift less than 180 degrees at unity gain. The phase shift above unity gain is not important, because a circuit can only oscillate when the gain is greater than one and the phase shift is 180 degrees. Most modern op amps are internally compensated to be stable to unity gain. Uncompensated amplifiers such as the

μA709 list the components that will stabilize the amplifier for a particular gain.

Internally compensated op amps such as the LM741 need no external compensation. A compensated amplifier has a built-in capacitor that causes the response to roll off at 20 dB per decade down to unity gain. The phase shift at unity gain is usually 90 degrees, but may be increased to say 120 degrees at some lower frequency. The op amp is unconditionally stable with any feedback.

Internally, the op-amp IC is a DC-coupled amplifier with differential inputs. The inverting "-" input produces an output that is 180 degrees out of phase with the input, while the non-inverting "+" input produces an output that is in phase with the input. The non-inverting input, sometimes called the reference input, produces an output that is equal to the non-inverting input times the gain of the amplifier.

The design of an operational amplifier gain block can be simplified with a few valid assumptions:

(1) The gain of the op amp is very large, essentially infinite.

(2) The signal input current into the amplifier is zero, the input resistance is infinite.

(3) The phase shift through the amplifier is 180 degrees for the inverting input or 0 degrees for the non-inverting input.

(4) The output resistance is essentially zero. The first assumption ensures that the voltage between the inverting and non-inverting inputs is essentially zero. The second assumption ensures that all of the current in R_1 must flow into the resistance R_f.

A simple gain block as shown in **Fig. 1(b)** results when the signal is applied to R_1 and the non-inverting input is at ground. The near infinite gain and negative feedback forces the inverting input to be the same potential as the non-inverting input. That is at "virtual ground." Under these conditions, the input current is E_{in}/R_1 and the load on the driving source is R_1. Since the current I_{in} in R_1 can only flow in R_f, the voltage across R_f is $I_{in}R_f$, and the output voltage must be $-I_{in}R_f$. The inverting gain is:

$$A_f = E_{out}/E_{in} = I_{in}R_f/I_{in}R_1 = R_f/R_1.$$

When R_1 is made up of two or more resistors, and with the inverting input of the op amp forced to be virtually zero, none of the current in R_{1a} flows in R_{1b}. The current flowing into R_f is $I_a + I_b$, and the output voltage is $E_o = R_f[E_a/R_{1a} + E_b/R_{ib}]$. When $R_{1a} = R_{1b}$, the output is the sum of the input voltages, and the op amp performs a summing function.

The op amp can also act as a non-inverting amplifier or buffer as shown in **Fig. 2.** The amplifier has negative feedback provided by R_f and R_1, but the input is applied to the non-inverting input. Again, the near infinite open-loop gain forces the inverting and non-inverting inputs to be virtually equal. Therefore, the voltage across R_1 is E_{in}. Since the current in R_1 can only come from R_f, the output voltage must be the sum of the voltage across R_1 and R_f, or:

$$E_o = E_{in}R_1 + E_{in}R_f = E_{in}(R_1 + R_f)$$

and the gain A_f is:

$$A_f = E_o/E_{in} = 1 + R_f/R_1.$$

The op amp performs as a buffer when the input is applied to the non-inverting input and the output is connected to the inverting input. With R_f zero, the gain is:

$$A_f = 1 + R_f/R_1 = 1 + 0/R_f = 1$$

The output is equal to and in phase with the input. The buffer offers a high input resistance (essentially infinite) and low output resistance (essentially zero).

When the feedback is provided by a frequency sensitive network, the gain

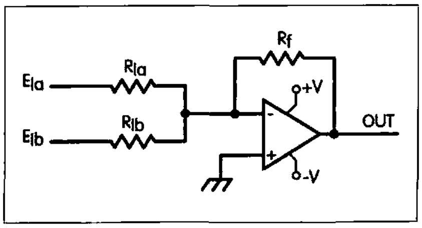

Fig 2. An op amp can produce in-phase gain.

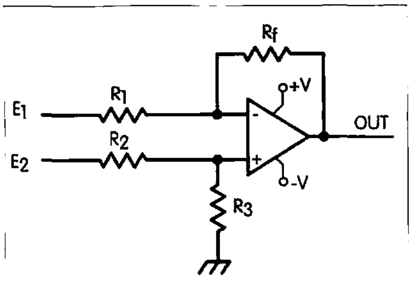

Fig. 3. An op amp can produce the difference of two voltages.

will be frequency sensitive. For example, if the feedback is provided by a capacitor C_f in parallel with R_f, the feedback impedance will be R_f at DC and zero above frequencies where X_c is essentially zero. The low frequency gain will be R_f/R_1, and will roll off to zero at 6 dB per octave above the corner frequency of $1/2\pi R_f C_f$ hertz, where R_f is in ohms and C is in farads.

Fig. 3 shows a difference amplifier in which the output is $E_o = E_2 - E_1$. The amplifier is basically a combined inverting amplifier and non-inverting amplifier. That part of the output due to the E_1 is $E_1(R_f/R_1)$, while the part due to E_2 is $E_2(1 + R_f/R_1)$. Since the gain afforded E_2 is larger than the gain afforded E_1, the input from E_2 must be reduced by R_2 and R_3 to equalize the gains. When $R_3/R_2 = R_f/R_1$, the output is:

$$E_o = E_2\,[R_3/(R_3 + R_2)]\,[(1 + R_f/R_1)] - E_1\,(R_f/R_1) = (E_2 - E_1)\,R_f/R_1$$

and when $R_f = R_1$, and $R_2 = R_3$, the output is $E_o = E_2 - E_1$.

An integrator results when the feedback is provided by a capacitor C_f. When the non-inverting input is at ground, a constant inverting input voltage produces a constant current in R_1 of E_{in}/R_1. The constant current in R_f flows into C_f and the output changes at a constant rate of $-E_{in}/R_1C_f$ volts per second, where R is in ohms and C is in farads.

The maximum rate of change of the output is given as the slew rate. A slew of 0.5 V/µsec is typical for garden variety op amps such as the LM741. Slew rate implies a bandwidth limitation. The bandwidth x rise time of an amplifier is 0.35. A rise time of 0.5 µs implies an apparent bandwidth of 700 kHz.

The non-signal characteristics to be considered in designing a particular "operation" are offset current and voltage, and bias currents. These characteristics don't affect the "operation" to be performed, but they do affect the DC output of the amplifier.

The input bias current is the base current in the input transistors and is peculiar to that particular device. The bias current is the average of the two input currents. Bias current flowing in the input resistors generates a voltage at the input of the op amp that is independent of the signal but is just as effective in producing an output voltage. In monolithic op amps, bias currents range from 1 nA to 1 µA.

Offset current is the difference in input currents. Monolithic op amps have offset currents ranging from 1 nA to several hundred nA. The offset current flowing in the input resistors produces a voltage that may cause either a positive or negative output voltage.

The voltage required across the op-amp inputs to drive the output to zero is called the offset voltage. The voltage ranges from 1 mV to 100 mV for monolithic op amps. Offsets are usually canceled externally; op amps such as the µA741 have a pair of terminals that can be used to null the offset. A 10 k pot with the arm grounded is connected between the null terminals to adjust the offsets to zero.

The effect of offsets depends on gain. For example, an uncorrected offset of 15 mV would produce an output of 1.5 V when the gain is 100. With AC coupling to small signals, the offset can usually be ignored. But, when the output is large, offset may cause one polarity to limit before the other. In general, it is a good idea to keep the input resistances equal, or unbalanced enough to null the effects of offset.

Operational amplifiers were originally intended for use in analog computers. Now they are used as gain blocks, summing and difference amplifiers, and in active filters that are only remotely seen as analog computer functions. Op amps are such a simple functional block, it's sometimes faster to use an op amp as a gain block than to design an amplifier stage with discrete components. Op-amp prices are quite moderate, and in terms of circuit board real estate, they are hard to beat.

An op amp is very tolerant of supply voltages, even though the supply voltages determine the limiting output swings that can be achieved. Usually any voltage between ±5 V and ±22 V is acceptable. In addition, power supply ripple is not a significant factor. Most op amps reject ripple by 90 dB or so.

The comparator is a close cousin to the op amp, as indicated by their identical circuit symbols. However, the comparator is not intended to operate with negative feedback, and has no control of phase. Also, the output of a comparator is an open collector and requires a resistor from the output to a positive voltage that need not be the same as the IC's power supply. Since the output has no internal pull-up, and there is no phase control, the slew rate can be quite high.

In a comparator, the output switches from the positive rail to within a few tenths of a volt above ground when the input to the inverting input is slightly more positive than the non-inverting reference input. When the inverting input is more negative than the reference voltage, the output is at the positive rail.

Positive feedback is often applied around a comparator to produce hysteresis that removes noise chatter at the threshold of switching. For the values

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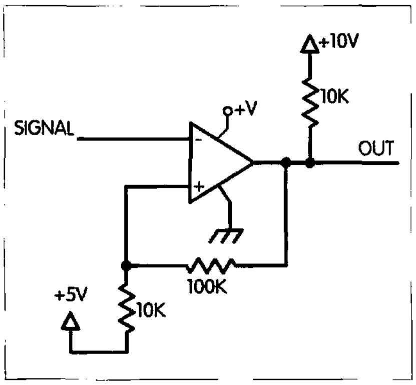

Fig. 4. Hysteresis in a comparator reduces the ambiguity of the threshold.

The Missing Link: A PSK Interface

Stop just reading about it — put this new mode into action!

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A new mode is rapidly gaining popularity on the ham bands. It's called PSK. Those of you who read a lot of technical material already know that stands for Phase Shift Keying, a signaling technique that has actually been around for quite a while on this planet (as well as off, since it's been used in deep space telemetry applications!).

The PSK advantage lies in its bandwidth, which is extremely narrow, allowing you to "slam the door" on accompanying noise to improve overall readability. A rough analogy would be to compare the output of an incandescent light bulb (like SSB or AM) to that of a LASER (PSK!). If your goal is to penetrate long distance with low power, you choose the LASER!

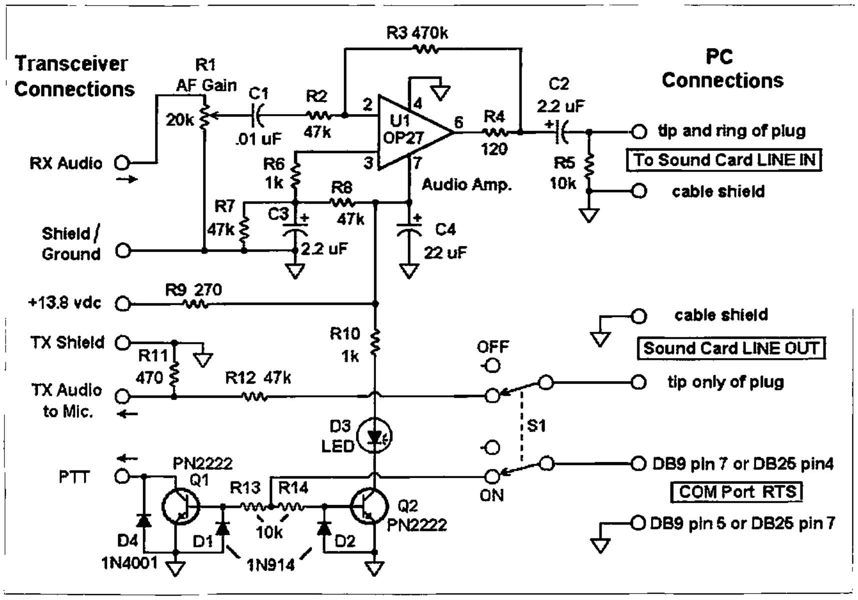

Fig 1. PSK1 schematic diagram.

PSK is a digital mode, something like RTTY, in which you type on a keyboard and read on a screen (or the printed paper output of your Model 15!). In the past, it required complex, expensive equipment designed specifically for this application. Today, you may already have two of the three main ingredients in your ham shack: a fairly modern HF SSB transceiver and a PC equipped with a sound card. The third ingredient (and this is the reason for all the excitement on the ham bands) is the innovative software called PSK31, written by Peter Martinez G3PLX. It not only uses the sound card to provide modulation and demodulation, but also provides digital signal processing of the received signal (and other clever features), the means by which advantage is gained in this narrow bandwidth mode (think of it as "software selectivity with intuition"). No need to go buy a super-duper narrow filter for your rig!

But you *will* need an interface to connect your PC to your HF transceiver, because the two are not quite compatible in a number of ways. It is customary in digital modes like this to use low-level receive audio from your

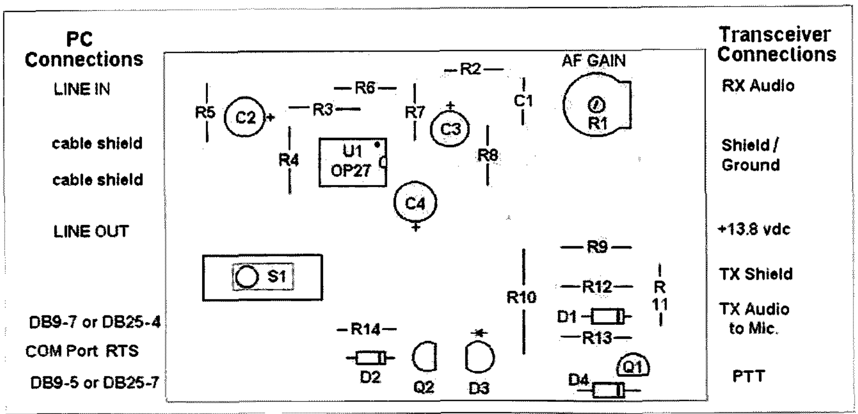

Fig. 2. PSKI parts overlay.

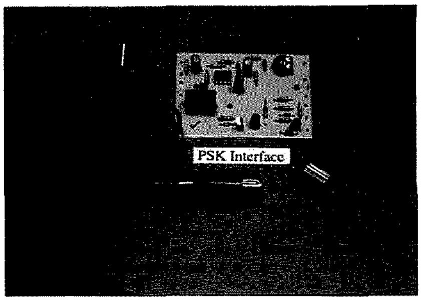

Photo A. The PSKI is quite compact.

transceiver (taken from a point between the last detector and volume control). When this is done, you're free to adjust transceiver volume to any comfortable listening level without disturbing the screen display. Fortunately, low-level Rx Audio is available at the rear panel accessory jack of many modern transceivers. This interface (the PSKI) includes an adjustable audio amplifier, U1, to boost it to a level suitable for sound card input.

On transmit, sound card output can easily overdrive the sensitive mike or Tx Audio input of your transceiver. The PSKI includes a 100:1 pad (R12 and R11) to attenuate this level. Transmit-receive switching with PSK31 is under keyboard/software control, employing the RTS or DTR pin of a user-selected COM port for output. But this control signal is RS-232 level, and must be converted to a "closure to ground" for compatibility with the PTT input of most transceivers. This is taken care of by Q1 and associated components D1 and R13. If your transceiver has a relay coil in its PTT circuit, D4 clips the resulting spike as its magnetic field collapses.

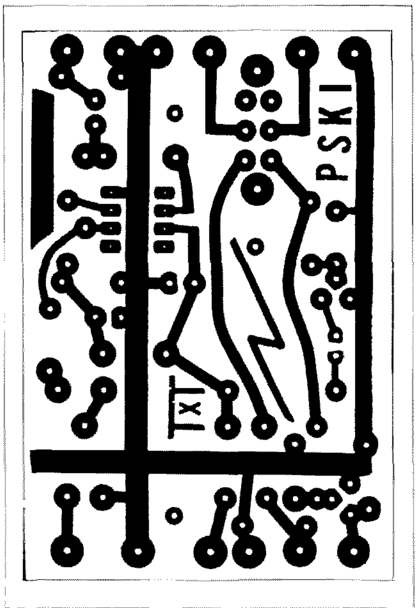

Fig. 3. PSKI board layout.

As you can gather, this mode places the transceiver under computer control (they call it "fly by wire" in aviation). And in this case, control is exercised by the RTS (or DTR) pin on the COM port, and the related software. This is no problem when you're running software designed for this application. It works fine. But when you are not running software that "knows" what to do with RTS or DTR, the results may be unpredictable and your transceiver may be inadvertently keyed while, just for example, you're playing Solitaire or off surfing the Net! That's bad. So I've included an LED Transmit Indicator circuit (Q2/D3) to alert you (it should only light up when you initiate Transmit from the keyboard), as well as On-Off switch S1, which should be switched on only when running suitable software for this mode. In other words, switch it on after the software is running, and switch it off before closing it and/or shutting down the PC. This will prevent any computer glitches or software ignorance from keying your transceiver.

A note for real-old-rig users: Q1 can switch PTT circuits up to a few hundred milliamps (more than enough for modern transceivers), but if yours requires more than that, or is highly inductive in nature (huge relays!), be prepared to disconnect the PTT line from your transceiver if it stays in Transmit even when the computer indicates Receive and the PSKI LED has extinguished (you've probably blown Q1!).

If you're adept at home-brewing and have a well-stocked junk box, this interface could probably be constructed on perfboard in an evening or two. I enjoy doing PC board layouts, so I've included the artwork designed for my interface along with a parts overlay to show where the parts go. Parts values can be found on the schematic diagram.

Hookup details for the transceiver and PC are provided on the schematic diagram and parts overlay (to the extent that is possible, considering there are so many different transceiver models!). In general, standard shielded stereo cables may be used for the sound card connections. Cut the plug off one end and connect directly to the interface. For Line In on the sound card, use both channels tied together, but for Line Out use just the wire going to the "tip" of the plug on the far end. Connect cable shields to interface ground as indicated. The COM port connection may be made with "twisted pair," "zip cord," or shielded cable if you have significant RF in the shack.

Going from the interface to the transceiver, shielded audio cable is especially important for the Tx Audio-to-Mike connection, even if you are actually going to an accessory jack on the rear panel instead. Shielded cable is probably a good choice for the Rx Audio as well. The PTT and +13.8 VDC connections need not be shielded

unless you have lots of RF in the shack. Ground returns for PTT and +13.8 VDC are made via the cable shields of Tx and Rx Audio, so there's no need to run redundant wires. If your transceiver doesn't supply +13.8 VDC at an accessory socket, you'll have to look for a place to "tap in" internally, or use an external supply (which will then require a ground return). A 9 V battery might do the job!

There you have it. The PSKI ties those minor loose ends together and you're up and running. Hope to "see" you soon on PSK!

Notes

1. PSKI kits are available. For details, write Lectrokit, P.O. Box 1856, Sandusky, OH 44871; or visit the Lectrokit Web site at [www.sanduskyohio.com/lectrokit].

2. To read more about PSK31, refer to the May 1999 issue of *QST*, page 41.

How to Turn a Deaf Ear

continued from page 14

The reflector element, in practice, added little to the SWR of the antenna. The phasing line used would have a much higher impedance than 300 ohms, lowering the effect of the extra driven elements on the SWR. Note that if you do use 300-ohm line, it must be of the air-spaced variety with dumbbell insulators—otherwise, it would upset the length of the transmission line because of the velocity factor.

The original antenna used three-eighths-inch-diameter elements; this was taken into consideration in calculating element lengths. The lengths and spacing for the antenna with a center frequency of 147 MHz are as follows: reflector, 40.5"; driven elements, 38.7"; spacing between driven elements, 20.1"; spacing between reflector and driven element, 16.1"; quarter-wavelength harness, 20.1"; three-quarter-wavelength harness, 60.3".

Simple scaling should be suitable for any center frequency in the two meter band when using three-eighths-inch-diameter elements. The TV insulators used for the prototype had a spacing of one inch between the inner ends of the driven elements, the securing screws being one-half inch out from the inner tips of the elements. Remember that the driven element lengths need to be cut in half. The reflector length is the calculated length shown from tip to tip. This length is correct only if insulated from and elevated above the boom. The TV insulators used held the elements approximately one-half inch above the boom.

This antenna was not designed for high forward gain but maximum rear rejection, so do not expect high gains. However, the forward gain is sufficient to be useful.

For those who have not realized it at this stage, I will point out that this antenna is a combination of two cardioid simulation antenna elements and a reflector element. Enjoy building this interesting antenna, which needs no involved matching system (see below). With horizontal polarization, no problems should arise with mounting the antenna. If vertical polarization is what you have in mind, then use a nonmetallic support between the elements. Otherwise, mount the antenna, or a pair of them, offset from the main support pole.

Finally, I suggest that when feeding the antenna you make use of a 1:1 balun or an RF choke. I have found that winding some RG-58CU coaxial cable into a close-wound coil on a length of one-inch plastic conduit is satisfactory. Seven to ten turns is sufficient with mounting close to the feedpoint of the antenna.

All About Op Amps

continued from page 26

(100 k and 10 k) shown in **Fig. 4**, the hysteresis is about 0.1 V. The output switches high when the input is below 4.09 V and switches low when the input is greater than 5.05 V.

If switching ambiguities are not a concern, the non-inverting input is just returned to the desired reference voltage, +5 V in the example, and no positive feedback is needed. Without hysteresis, the output switches from high to low when the input is greater than 5 V, and from low to high when the input is less than 5 V.

The operational amplifier and comparators are great additions to the devices available to the designer/builder. They are easy to use and there are no tricks in their application. The Philbrick amplifier might have been the first op amp, but it certainly wasn't the last.

Radio Fun in the Sun

Here's a complete solar-powered QRP station for your operating pleasure.

Dave Evison W7DE
153 Park Avenue
Palo Alto CA 94306
[w7de@aol.com]

I've become a full-fledged tree hugger, energy miser, and recycler. I suspect it has something to do with the aging process and my own diminishing physical resources. I feel it happening to me, and see it happening to our little planet.

Now this attitude is spilling over into my amateur radio hobby. I want to be out in the woods, energy independent, and still play with my homebrew stations. In addition, I'm no longer interested in re-inventing the wheel, or plunking down big bucks to buy ready-made radios. So I began pawing through back issues of *73 Amateur Radio Today* to recycle some great ideas and circuits for building myself a portable, self-sufficient QRP station. And I struck gold: the Ten-Tec QRP transceiver kit was purchased and assembled based upon an excellent review in *73;* the Desert Storm solar panel was selected because of a long-running advertisement in *73;* the expanded-scale voltmeter was a clever idea published by a fellow ham in *73;* and the simple charge controller was borrowed from a previous article of mine, also appearing in *73.*

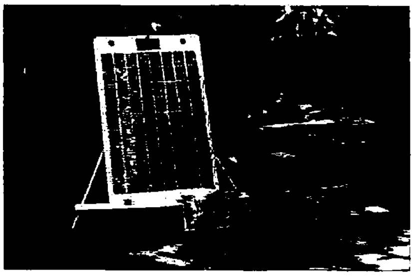

***Photo A.** W7DE's solar QRP station is handsome as well as functional.*

The purpose of this article is not to encourage a cloning, but to share the delight of building a portable, solar-powered QRP station. The emphasis is upon building and incorporating simple amateur radio station accessories, based upon your own ingenuity and resources. The station depicted in the photos reveals that I'm from the school of form follows function. In my own case, since I have very few woodworking and metal forming tools, I used scrap lumber to build the case, a number of small pieces of two-sided PC board for mounting the various accessories, and a lot of screws to hold everything together. As chaotic as the little station appears, it works wonderfully! It is a complete station (including station monitoring equipment), and when I get the urge to play radio in the woods, everything I need is connected to a couple of carrying handles!

My station was evolutionary in its formation. It began with only the transceiver and a battery fastened to a board with a handle. Then, one after another, came the rest of the bells and whistles. It was a lot of fun! I'd dream up the need for an additional station accessory, build it up on a scrap of PC board, then screw it onto the wooden case. Although this approach may reflect poorly on foresight, in its final form, the accessories are symbiotic—not parasitic.

The following notes and associated drawings describe the subassemblies

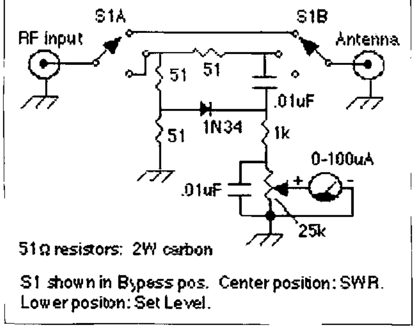

***Fig. 1.** QRP SWR meter schematic.*

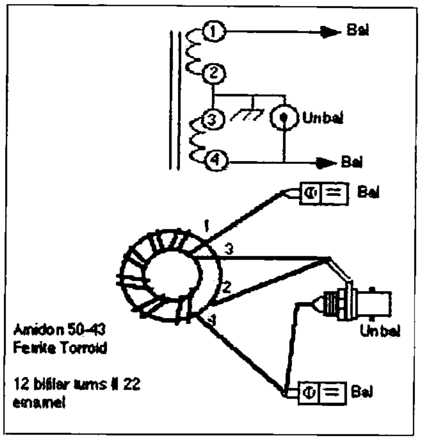

Fig. 2. QRP 4:1 balun schematic and pictorial.

that now cling to the wooden case of my portable QRP station. Some of them are essential, some of them might come in handy, and only one is original—but all of them are useful and fun to build. No detailed physical construction guidance is supplied in this article. It's assumed that doing things your own way is the radio amateur way!

About the transceiver: Although I used the Ten-Tec 1340 QRP kit, there are other terrific kits available (including the bulletproof little NorCal 40A, from Wilderness Radio).

About the battery: Gel-cell batteries are rugged—and they don't leak electrolyte! Don't skimp on the battery by buying a surplus battery—buy a new one. A 4.5 Ah battery will be sufficient for a QRP rig. In the afternoon sun, the solar panel delivers enough power to operate my rig with the key down and still charge the battery. Three hours of nighttime operation will still leave the battery with about 66% of full charge.

About the SWR meter: A sensitive

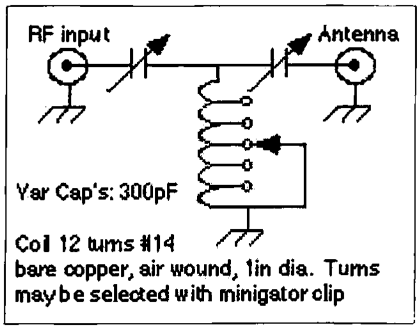

Fig. 3. Antenna tuner schematic.

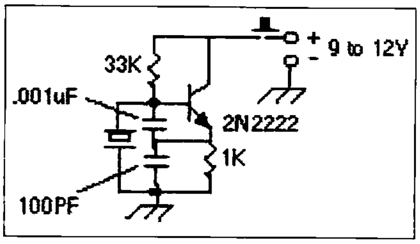

Fig. 4. Signal generator schematic.

SWR meter is an excellent accessory, and it is used together with the antenna tuner. In addition to monitoring the SWR during tuneup, the set level control of the SWR meter can be calibrated to indicate where the sensitivity pot is set for normal RF output from the integrated rig. Therefore, it can double as a relative wattmeter. The schematic appears in **Fig. 1**.

About the tuner: Camping sites vary dramatically, especially when it comes to finding antenna supports. Therefore, compromises are necessary, and antenna

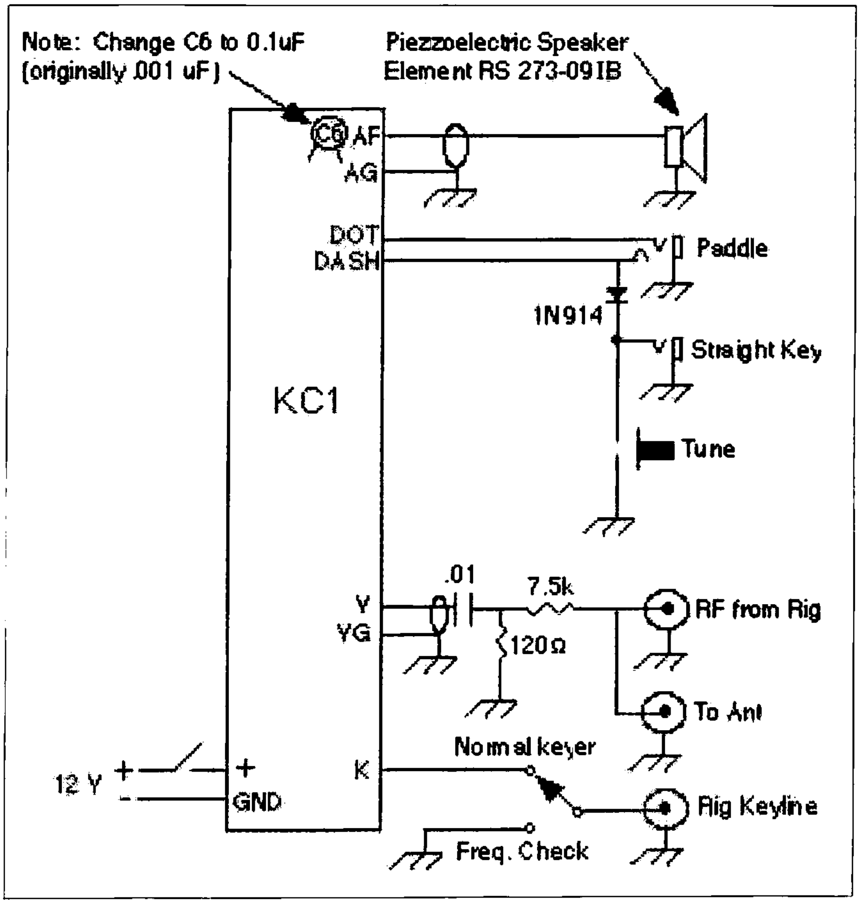

Fig. 5. Interface control panel schematic for Wilderness Radio KC1 keyer and frequency counter.

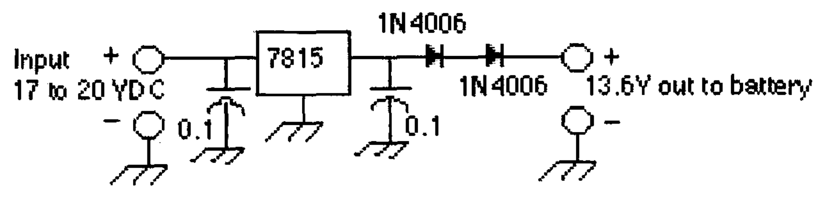

Fig. 6. Charge controller schematic.

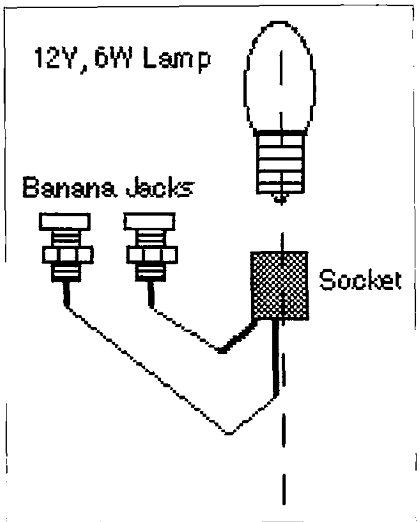

Fig. 8. Solar panel tester.

tuning is generally required for maximum performance. A capacitor-capacitor tapped inductor tuner works great, and it can be constructed at very low cost.

About the 4:1 balun: The balun does not take up very much space, and it will allow you to use balanced feedlines. You will be able to use folded dipoles and other antennas using balanced lines—then you won't need to worry so much about poor grounding circumstances. Details are shown in **Fig. 2**.

And if miniature variable capacitors (the type used in transistor pocket radios) are used, the unit can be quite compact. There's nothing particularly critical about a tuner such as this; in fact, the uglier they are, the better they seem to work! Refer to **Fig. 3**.

About a signal source for checking the receiver section: This is another simple and useful addition. It will allow you to accomplish simple performance tests for sensitivity and frequency calibration. A simple one-transistor circuit is depicted in **Fig. 4**. No direct connection needs to be made to the transceiver. The little oscillator will put out enough RF to be readily detected. I chose to run the oscillator from a 9 volt battery. The battery will last for years. The crystal specified in the drawing is for 40 meter operation. The oscillator will accept crystals to 20 MHz.

About the keyer: If you're comfortable with a straight key, you simply don't need a keyer. In fact, you don't even need a key! One resourceful ham suggests recycling a computer keyboard switch for forming the dits and dahs. If you decide to use a paddle, there are several excellent amateur keyer kits available. I selected the Wilderness Radio keyer because of its very small size, low battery demands, integrated memory and frequency counter. This unit is designed to be built into the transceiver itself. However, I chose to build it as a stand-alone unit to allow me to substitute other transceivers. The stand-alone modifications to the Wilderness Radio keyer are depicted in **Fig. 5**.

About the charge controller: If you elect to charge the battery exclusively from the solar panel, you simply do not need the charge controller. In my case, I included the controller for wintertime operation in the Northwest. I use a salvaged 12 volt plug-in wall unit as the charging source. Although the little plug-in wall unit claims to deliver 12 volts at 300 mA, its unloaded terminal voltage is actually 19 volts. It is, of course, simply an unregulated supply, and its internal resistance drops its terminal voltage to approximately 12 volts when supplying 300 mA. This is ideal for use with the simple charge controller shown in **Fig. 6**. The charge controller functions by supplying a regulated 13.6 volts (the forward drop of the two diodes reduces the 15 volts from the 7815 to 13.6 volts). The battery charging rate decreases as the battery terminal voltage increases during charging. When the battery terminal voltage (surface charge) equals 13.6 volts, the charging process stops because there is no longer a potential difference between the charging source and the surface charge of the battery. Simple, straightforward, and it works perfectly.

About the dummy load: A simple dummy load fashioned from carbon-clay 2 watt resistors is a very useful addition. Of course, other combinations of resistance values may also be used to achieve 50 Ω and a power dissipation rating of 5 watts or greater. Refer to **Fig. 7**.

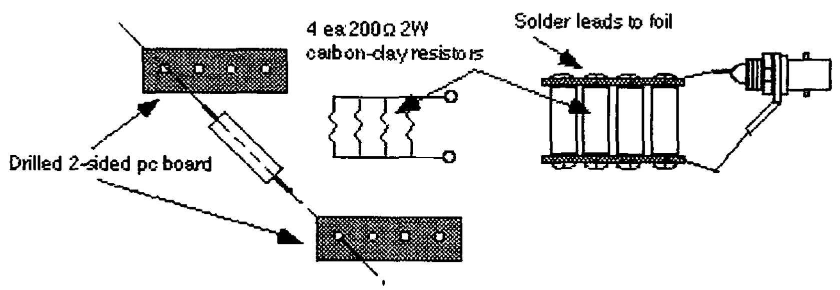

Fig. 7. 50 Ω dummy load.

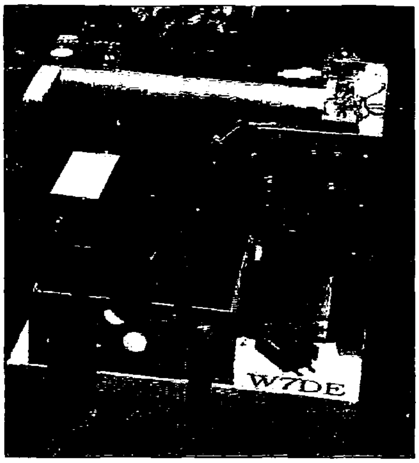

***Photo B.** Front view of portable QRP station.*

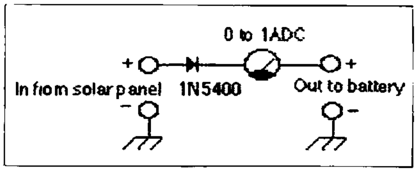

Fig. 9. Solar panel interface schematic.

About the solar panel tester: This is merely a 12 volt, 6 watt incandescent lamp. You simply connect the solar panel to the lamp and adjust the angle and position of the panel for maximum brightness of the lamp. Once this adjustment is made, transfer the solar cell connector to the battery. This is a super-handy accessory—actually a necessity! Refer to **Fig. 8**.

About the solar panel interface: Well, you have to have someplace to plug the solar panel into, and a place to install the series diode. It is also useful to include an ammeter to monitor the charging current. Using banana jacks and plugs is recommended for connecting the solar panel to the station. Two-circuit, 1/4-inch phone plugs and jacks are not recommended, because the tip electrode of the plug shorts out momentarily while inserting it into the jack. Refer to **Fig. 9**.

About the solar panel: The Desert Storm solar panels are available from Antennas West. These are very compact and rugged units. They are not cheap, but well worth the money.

There are two very important requirements for using the Desert Storm unit: First, a series diode between the positive lead of the solar panel and the battery must be used (a Radio Shack diode, #276-1141, will do the job); and second, the panel must be adjusted periodically to track the Sun and maximize power output. Using the 6 watt incandescent lamp really speeds up the positioning process. Notice the small, collapsible aluminum stand; it allows you to securely position the solar panel. The stand was purchased at an art supply store. The Desert Storm solar panel was my first serious experience using solar energy for amateur radio. It's a very exciting experience to work another amateur station hundreds (and even thousands) of miles away, and know that you're using the ultimate power source—the Sun!

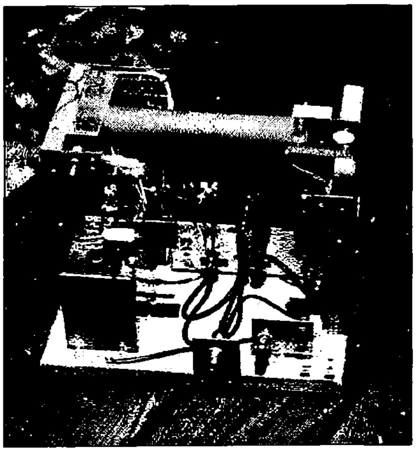
Photo C. Rear view.

About the paddle: The Paddlette is a terrific little paddle, and I built one into my station. There are several paddle kits on the market, and they look very promising.

About the expanded voltmeter: This excellent item was discussed in the "QRP" column by Mike Bryce WB8VGE, on page 70 of the June 1991 issue of *73*. The expanded voltmeter will allow you to assess the


Photo D. All packed up and ready for a little Radio Fun in the Sun!

Continued on page 38

Number 34 on your Feedback card

Bend and Brake!

Customize your home-brew projects with tailor-made enclosures—and lots more!

Dave Evison W7DE
153 Park Avenue
Palo Alto CA 94306

I realize this review appears to belong in *Popular Mechanics*—not in an amateur radio magazine. However, the compact shear, brake and roller unit described and evaluated is a wonderful tool for radio amateurs who build their own equipment.

I recently purchased one of the Central Machinery units to support my home-brew addiction, and I've found it superbly useful, especially for working with printed circuit board.

Printed circuit board is one of the most versatile materials available for use in amateur construction. Beyond its customary use for printed circuitry, it can be used for instrument panels, breadboarding, name plates, even complete instrument enclosures. It is easily drilled, tapped, soldered, and polished. And printed circuit board "trimmings" (left over when manufacturers cut up large sheets) find their way into surplus stores and are sold for a few cents per square inch.

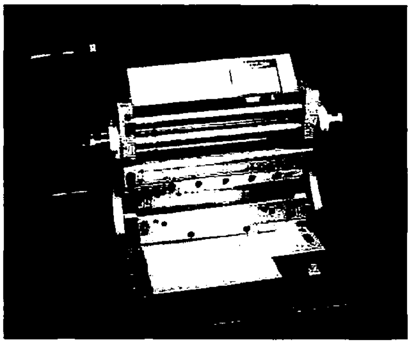

Photo A. The Central Machinery 12-Inch Shear, Press Brake and Slip Roll unit.

The most difficult fabrication process with PC board is cutting it into geometrically accurate pieces. While small pieces of PC board can be cut with a hacksaw and filed to form acceptable shapes, larger pieces are difficult to form—unless you have a sheet metal shear.

The Central Machinery unit can be used to produce metal chassis boxes, brackets, sheet metal cylinders, cones, etc. While I have yet to master the skills to produce all of these items, I *have* produced terrific project-specific sheet metal enclosures and brackets, as well as geometrically precise PC board parts. I'm convinced that the extra capability will come in handy in the future (however, I suspect I will require some one-on-one instruction from a sheet metal craftsman). The shear capability alone is worth the price of the tool, and the ability to utilize commercial PC board trimmings for my laboratory projects has already paid for the tool.

The Central Machinery shear is a rugged item and deceptively heavy for its size. The tool's footprint is 14-1/2 inches wide, 11-1/2 inches deep. It is 16 inches high, weighs 125 pounds, and requires a substantial work stand to support it securely. This is a tool designed for a metalworking shop, where ruggedness and accuracy are the primary criteria, and minor cosmetic details such as dressing rough edges of castings are simply ignored. However, all working surfaces are well machined.

Specifications

Shear specifications: 20 gauge milled steel to the full width of the bed (see comments below).

Wire forming groove sizes:
3/32", 1/8", 5/32", 3/16", 7/32", 1/4"
Die set sizes:
1/4", 3/8", 1/2", 1", (2 ea.) 2", 3", 4"

There were some minor flaws in my shear-brake:

Continued on page 38

Photo B. Set up and ready to while away a dark winter day in a home-brew wonderland.

Instruction Instructions

Discover hidden savings in the last place you'd ever look—the instruction manual.

by Leon Fletcher N6HYK

Recently I bought an antenna system consisting of the usual four units—tower, antenna, rotor, and rotor control. All the gear is nationally advertised, widely used, and highly regarded by hams throughout the country.

But every unit came with printed instructions that had serious errors, omissions, confusions, even contradictions. Indeed, at least one error was an absolute farce.

How serious is the problem of ham gear supplied with instructions that are inaccurate, inadequate, inferior, incomplete, or just plain bungled? Apparently no one knows. At least a diligent search of ham magazines, handbooks, guides, instructions, and other such publications found no helpful reports, tips, or solutions.

Casual on-the-air comments by hams in Washington, Ohio, Florida, Nebraska, California, and other states, however, confirm that poor instructions are indeed a widespread concern.

Ham talk also seems to document that most of us select our gear without giving much thought—perhaps no thought at all—to the effectiveness of the printed instructions that come with our purchases. Yet it is obvious that good instructions can make assembling and operating a unit easy, fast, efficient, and safe—a pleasure to own.

On the other hand, poor instructions can cause delays, waste efforts, spark frustrations, increase costs, produce errors, ruin equipment, and create dangers. In extreme cases, injuries can result.

From my unpleasant struggles with poorly written instructions have come 10 key questions that can help all hams select their gear more intelligently. Along with these questions are specific examples of poor instructions that accompanied ham gear sold in the past year. By now, however, at least some of the problems—it is hoped—may have been corrected. Therefore, the names of the offending companies are not mentioned.

1. *Can you read the instructions before you buy the gear?*

The manager of the Cupertino, California, store told me, "Take all the time you need." On the other hand, when I phoned cross-country to ask a manufacturer of antenna towers for a copy of the instructions for putting up one of its towers that I was considering for purchase, the chief engineer told me, "We don't lend or sell copies of our instructions. You'll get them when the tower's delivered." By then you are of course pretty much trapped into using the instructions, bad as they may be; it's clearly not practical to return a tower that can cost several hundred dollars for shipping alone.

2. *Do the instructions make sense?*

Some ham gear comes with instructions that are clearly impractical, unrealistic, even downright foolish. An overstatement? Consider this example.

This farce was included in the 15-page *Instructions for Installation and Operation* for a nationally advertised antenna tower. The purchaser was instructed to lay a concrete foundation on which to raise the tower—a foundation 24 inches square and ten inches deep. That would be a block weighing some 500 pounds.

A few pages later, those same instructions told the purchaser that *after* the 480-pound tower was in place on top of that 500-pound foundation: *If tower is out of plumb, shift the concrete foundation block to bring it into vertical alignment, and then backfill firmly around the foundation.*

Can you imagine the struggle to try to prop up one corner of that 25-foot-high, 980-pound mass, or lowering another corner, to get the entire installation sticking straight up in the air?

3. *Are the instructions free of contradictions?*

Instructions that came with one "world famous" beam antenna warned, "Correct assembly and dimensional

Condensed from *73 Amateur Radio*, March 1986.

adjustments are very important to successful operation." Later in those same instructions, the length of one part of an element was stated to be 51 inches; in a table that followed, the length for that same part was given as 50 inches.

Worse still, when I phoned the manufacturer to ask which dimension was correct, I was told, "Ohhh, yes ... we know about that error. But we haven't got around to correcting our instructions as yet."

Contradicting instructions also came with that infamous tower we've been using as a fine source of poor instructions. On one page the purchaser was told to place the "base hinge plate [which attaches the tower to the concrete foundation] hinge side away from the wall as shown on Detail FB." That "detail," a drawing on the next page of the instructions, showed the hinge reversed, its side toward the wall.

Later, those same instructions introduced two contradictions with one sentence. It said that the "pulley and safety rest have been inverted so that its [sic] arm will not project outward" during shipping, and therefore "must be reversed as explained below." The instructions "below" never mentioned reversing the pulley; however, that made sense because the pulley arrived not reversed as stated, but welded firmly in position. And the safety rest, which the instructions said to "reinstall," arrived not installed in reverse, as claimed, but came uninstalled, in parts, unassembled.

__ 1. Can you read the instructions before you buy the gear?
__ 2. Do the instructions make sense?
__ 3. Are the instructions free of contradictions?
__ 4. Are the instructions free of unnecessary jargon?
__ 5. Are the instructions specific?
__ 6. Are the instructions clear?
__ 7. Are the instructions in a logical sequence?
__ 8. Are the instructions free of any "surprise instructions" that may come after you've ordered the gear?
__ 9. Do the instructions include a phone number you can call for help—ideally, an 800 (toll-free) number?
__ 10. Are you confident the instructions tell you everything you need to know?

***Table 1.** Judging instructions for ham gear check-off list. When evaluating the instructions that accompany ham gear you are thinking about buying, check off each item above to help you decide if the instructions are effective.*

4. *Are the instructions free of unnecessary jargon?*

The problem in trying to establish guides for this criterion is that language that is jargon to one person may be perfectly understandable to someone else. Furthermore, the more you read and use jargon, the quicker it may become understandable and therefore acceptable.

The first time I read the *Owner's Manual* for my new rotor control, I was confused by such jargon as "Rec Last," "SCAN then 7," "Counter Clockwise end travel," "access memory location #1," and many other expressions. But at this moment, after rereading the manual many times during the several months I've been using the control, I'm having difficulty finding examples of jargon in the manual; I've finally learned the language.

So try to avoid instructions that are jargon-packed, but also remember that those strange-sounding sentences will probably become clear to you as you re-read the instructions and work with the equipment.

5. *Are the instructions specific?*

The instructions for the winch that came with my antenna tower included this great line: *If brake disc mechanism operates intermittently or erratically, brake disc inspection should be accomplished.*

Ignoring that twisted syntax, I searched without success for instructions on how that inspection should be "accomplished." Should I dismantle the winch? Should I look for loose parts, dangling cable, or whatever? *Well,* I thought, *forget the inspection—how do I fix the winch when it operates "intermittently or erratically"?*

No instructions on that, either.

Other nonspecific instructions you should watch out for include such lines as: "Adjust as may be needed." "Place in a suitable location." "Tighten as required."

6. *Are the instructions clear?*

The 30-page booklet that came with a nationally advertised rotor control unit included instructions not only for the model I bought but also for two similar but more sophisticated models.

If the instructions for those other models had been in separate sections of the booklet, there would be no confusion. But this instructional booklet intermixes directions for operating all these units. Often there is little or no indication that the instructions do not apply to my particular equipment. When I first read those instructions, I would suddenly find myself trying to learn how to operate features that were not on my model. Confusing indeed.

7. *Are the instructions in a logical sequence?*

I haven't found any manufacturer's instructions that say something such as, "But before doing that last step, you must ..." But some instructions come pretty close to such confusion.

Page 11 of instructions for assembling a beam antenna said to install screws, lock washers, and nuts on some straps. The instructions didn't state on which side the screws should be placed, yet in later steps the placement of that hardware became critical.

A very serious injury was almost caused by what was left out of another instruction. It said to "mount the balun clip to the circular boss." It did not include a warning that during the mounting, the clip might become loose and fly off at a high speed. It did fly off, hit me in the forehead, break the skin, and cause bleeding; if it had hit me just one inch lower, I would probably now be blind in one eye.

On the other hand, if you want to read instructions that are a model of logical sequencing—indeed, a model of the ideal instructions by almost every criterion—look at a Heathkit manual. Each of the more than 25 Heath manuals I've used starts with an "introduction," a brief overview of the purpose, use, and features of the unit. Next are tips for "Unpacking," to make sure you do not mix parts intended for

one board, for example, with those to be used on some other board. Heath manuals also present "Assembly Notes," hints on tools, identifying parts, soldering, and such.

Then come detailed step-by-step assembly instructions presented in a very logical, clear-cut sequence. There's a check-off system to help ensure that you install each part correctly. There are numerous drawings, enlarged drawings of small units or more difficult steps, and photos. Many parts are identified four ways: by Heath part number, circuit component number, electronic values, and by a description of markings.

Final sections of Heathkit manuals present operating guides, procedures, "In Case of Difficulty," specifications, circuit description, schematic, and other details. Unlike some other instructions, you'll rarely need to search back and forth through Heathkit manuals for an out-of-sequence step.

8. *Are the instructions free of any "surprise instructions" that may come after you've ordered the gear?"*

"Surprise instructions" are such unrevealed details as additional equipment that may be needed, restrictions on use, limitations on locations, unexpected safety recommendations, unmentioned delivery problems, and such.

About a week after I'd ordered that infamous tower—but *before* the tower was delivered—I received in the mail three additional instructions from the manufacturer—details I'd not been told about before ordering the tower.

One instruction was printed in brilliant red on bright yellow paper. Across the top of the page, in letters a half-inch high, was the word "*Warning!*" Then came these statements (among others):

• Be sure to check your shipment carefully before acceptance.

• All shipments are made at the risk of the purchaser and (name of the tower) will not be responsible for shortage, loss, or damage occurring in transit.

As fate would have it, the antenna was delivered during a heavy rainstorm. But even without the rain, you can imagine the problem of trying to get a big and busy truck driver to wait as you unpack, count, and inspect some two dozen parts ranging from 20-foot tower sections to 1-1/4 inch cotter pins.

A second page of surprise instructions came only after the tower was ordered. It was titled "Duty of consignees to accept freight even though damaged." It presented four long paragraphs of quasi-legal statements claiming that if what I'd ordered was delivered in a damaged condition, I had to accept it no matter what! The final point in those instructions: If the gear arrives damaged, "it is decidedly to [your] advantage to either repair [it] and file claim for cost," or "to sell the merchandise 'as is'" and then "file claim for the loss suffered."

Sure enough, the gear arrived damaged. I phoned the manufacturer and firmly pointed out that while such a provision might be enforceable in the state from which the tower was sent, it probably could not be enforced under the laws of the state in which it was delivered. The manufacturer backed down immediately and sent replacement parts.

Another example of surprise instructions came with a beam antenna. It was not until page 16 of the instructions—just as the antenna was about ready to be raised—that I was told I'd need a 3- or 4-foot mast ("not supplied") to use in finding the "balance point" of the antenna.

While many hams have hefty stocks of such supplies stored at their QTH, I don't. The result can be an unexpected dash to the hardware store, inconveniently and unfairly delaying friends who have gathered to help raise the antenna. A minor point? Perhaps. But why shouldn't all instructions present—right at the start—a list of everything you'll need to complete the project?

9. *Do the instructions include a phone number—ideally an 800 (toll-free) number—you can call for help?*

If the instructions you're evaluating don't give a phone number, there are three steps to getting information you need.

First, of course, phone the store from which you bought the unit. If the staff there can't give you the information you

Continued on page 38

Instruction Instructions

continued from page 37

need, then phone the corporate headquarters of the manufacturer of the gear. Ask for "customer service" or "the expert" on the gear that has the problem instructions.

If you still don't get the answers you need, don't hesitate to phone the president of the company. It's been my experience that a surprising number of top executives are readily available and will have the information you need sent to you quickly. Indeed, I find that the president's personal secretary (but often no one less) also will get you answers promptly.

The doubter asks, "What about the extra cost for the phone calls?" Even several cross-country calls cost but a tiny percent of the expenditure you are considering investing in the gear. Besides, you may be lucky. When you call, the key person may not be in, so you can leave a message asking him or her to return the call to you; then the cost is on the company's bill. Presidents, in particular, I notice, generally return calls promptly.

10. *Are you confident the instructions tell you everything you need to know?*

This question is obviously difficult to answer—perhaps impossible—until you are actually trying to follow a set of instructions. Still, there are a few precautions you can take.

First, you can try to find some other ham who has used the gear, and ask him or her how complete the instructions are. You might have used another set of instructions, for some other gear, put out by the same manufacturer. Check these: the chances are that if a company has prepared clear-cut, specific, valuable instructions for one of its units, then instructions for its other gear are likely to be effective, too.

Another possibility: Compare the instructions with those prepared by another company.

As a last resort, you might ask a salesperson or a manufacturer's representative if the instructions include all the information you'll need. It's not likely they'll tell you about any shortcomings, but if they say, "Yes, the instructions are complete," and you find later that they are not, you may have a bit more clout in trying to get the additional information you need.

In sum, as you consider the purchase of any piece of ham gear, you should be able to answer "yes" to all, or substantially all, of the above questions to help ensure that the instructions for the equipment are effective. If you must answer "no" to more than a few of those instructions, you might well shop around for some other unit that may have better instructions.

Realistically, many of us don't want to reject buying a unit just because the instructions are poor. So if you find good gear with poor instructions, you should certainly contact the manufacturer to try to get clarifications.

Still, one key problem remains: Many instructional guides seem clear-cut and easy-to-follow when you're considering the purchase, but later, when you're assembling, installing, or operating the gear, you may face doubts, questions, and confusion.

Unfortunately, shortcomings in instructions for ham gear will very likely continue until hams themselves unite to tell manufacturers that their instructional manuals must follow specific criteria. Until then, we'll have to continue to depend on the ancient Latin proverb *Caveat emptor*—Let the buyer beware. 73

Radio Fun in the Sun

continued from page 33

battery's state of charge as a function of terminal voltage. Another expanded voltmeter is discussed by Mike in his December 1991 "QRP" column on page 69. The December 1992 issue carries a complete feature article about an Expanded Scale Voltmeter.

Of course, this list is only the beginning: There are a myriad of simple—yet useful—station accessories just waiting to be included.

A portable, solar-powered QRP station, such as the one described in this article, can provide many hours of enjoyment while you build it, not to mention years of operating fun after. And, of course, Ol' Sol will provide the operating power as well as those great spots for DX propagation. 73

Bend and Brake

continued from page 34

- The stock guide was installed on the wrong side of the tool (on the right side instead of the left side).
- The back gauge assembly is flimsy, and mechanically awkward. I simply removed it, and found it better to rely upon the precision of a scribed line. However, if you are cutting a large number of items to precisely the same length, the back gauge will prove helpful (and once set it will provide reasonable accuracy).
- While the shear is advertised to accommodate stock up to 12 inches wide, this is only true for the very thinnest of materials. For example, the shear would only accommodate an 11-3/4-inch piece of standard paper card stock. For 1/16-inch PC board the width is limited to 10 inches.

I called Harbor Freight's technical support group about these problems, and while they were polite, they said there was nothing they could do about it, and I could return the tool. But I was so pleased with the overall operation of the tool, I repositioned the guide myself; this involved laying out the two new holes using a high-quality combination square, center punching, drilling and tapping. It now works perfectly.

There is another prudent limitation for this shear: Except for very small pieces of PC board (two inches or less in width), the maximum thickness of the PC board should be limited to 1/16-inch.

In summary, the shear-brake is a very useful tool for any serious amateur builder, small laboratory, or amateur radio cooperative. I grin every time I use it, because I remember the crude hacksaw cuts and the tedious filing that I no longer have to deal with. The Central Machinery 12-Inch Shear, Press Brake, and Slip Roll is available from Harbor Freight Tools. The item number is 35969-2AAB. Their number is (800) 423-2567. The tool (which normally sells for $200) was priced in the latest catalog I saw for $180—and Harbor Freight will pay the shipping! 73

Ham Station Control and Monitor

You can do without this handy project—or can you?

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The accessory described here is designed primarily for QRP home stations, but the methods used are applicable to QRO stations as well. All stations that use a storage battery of any type for backup power in case of loss of AC or during brownouts will find this design very handy. And even if you don't use a battery backup, you'll find it very useful because it does so much so simply.

What it does

Normal operation of two separate transceivers, such as one HF and one VHF/UHF (or any combination), will normally use the AC-operated power supply (PSU) for operation. If a backup battery is used, it will be on float charge at all times the AC power supply is in use, and totally disconnected at all other times. QRPers like to keep their small gel cell batteries topped off for quick use in the field or in emergencies. And in case of power loss, a quick flick of one switch connects the storage battery to supply 12 volts to the station to keep it operating. This unit is also fused for protection.

A surplus meter mounted on the panel, in conjunction with a 2-pole 3-position rotary switch, allows rapid checking of DC voltage and current. The third position of this switch performs some RF magic and allows easy setting of the antenna tuner (ATU) for maximum output power simultaneous with the absolute minimum SWR the ATU is capable of producing. This proves your RF power is radiating, eliminating the need for an SWR meter and a field strength meter (FSM) at the operating position. More about this function later.

Provisions are incorporated to switch both audio out and key line input from your choice of two rigs to jacks on the panel for speaker and key. A headphone jack is included and mutes the speaker when the phones are plugged in.

The main DC line is heavily bypassed, both where it enters from the station power supply and at the multiple DC output connectors which provide power to both transceivers and all accessories. This precludes any electrical hash being transmitted between power supply and rigs.

As designed, operating voltage is indicated on a suppressed-zero, expanded-scale meter for the best accuracy. Even very small voltage changes will be easily noticed.

What it has in it

Not much, really—just mainly inexpensive connectors, three switches, surplus meter, three diodes, and a very few resistors and capacitors. Refer to **Fig. 1**, the schematic diagram, for the complete picture.

The cost to build this unit using all new (surplus) parts will easily be less than $30, not including the enclosure. In fact, most hams will have all or most of the parts in their junk boxes. If a suitable-quality meter is missing from the junk box, do not despair. You can get five high-quality surplus meters for only $10 from Fair Radio Sales Co., P.O. Box 1105, Lima OH 45802; (419) 223-2196; catalog number 47-84. Shipping is extra. Although the choice of the meters you get is theirs, not yours, at least one meter, and probably two, will be exactly what you need to build this unit. Too, you will have four nice meters left over for other projects.

Making your meter read volts and amps

For a comprehensive but simple and understandable description of how to

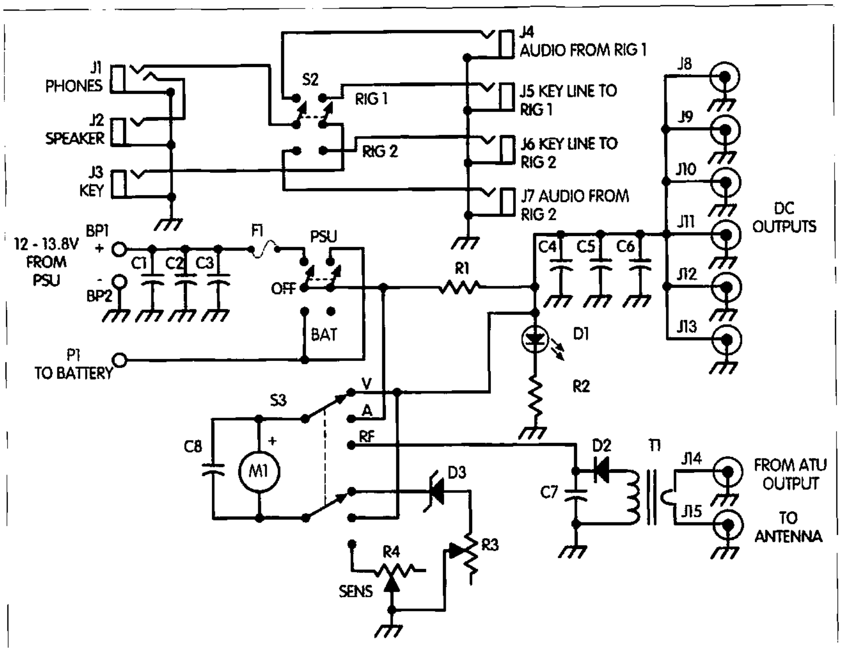

Fig. 1. Schematic diagram. Note: The following components should be placed on the front panel: J1, J3, M1, R4, S1, S2, S3. Remaining connectors should be mounted on the rear deck.

disassemble (to remove shunts, rectifiers, and multipliers, or change the scale), reassemble, and measure meter movements, please refer to my article, "Use Those Surplus Meters," *73 Amateur Radio Today*, January 1992, page 42. If you don't have or can't locate a copy, you can order photocopies of articles or back copies of the magazine direct from *73*.

However, I'll give you some quick and simple methods for making your meter into a suppressed-zero, expanded-scale voltmeter, and how to make a shunt so that it will indicate over the desired current range.

You must know the resistance of the meter movement, the full scale current, and the voltage drop across the meter movement at full scale, but these are easier to determine than you may imagine.

First, measure the resistance with a DMM on ohms scale. It might be anything between 2 and 2000 ohms. If it is much higher than 2000 ohms, it probably contains an internal voltage multiplier and will have to be taken apart to have the multiplier removed and replaced by a short wire, or simply shorted out with a piece of wire. Or, you may have another meter that will work just as well.

Caution: Do not ever use an analog VOM on ohms to measure meter resistance! The VOM voltage and current are so high that it can wrap the needle around the pin or burn out the movement of your meter. Use *only* a DMM!

In many instances, the full scale current is printed on the meter face. Ignore whatever scale the meter has. Look low on either side of the movement through the front glass of the meter. It is usually on the right side. Look for very small print such as: "F.S. 50 µA" or "F.S. 1 mA." If it isn't present you can do it the hard way, with a flashlight battery, potentiometer, and DMM set to measure current. When the needle on your meter is at full scale, *write this value down and save it!* Make sure you also wrote down the meter resistance. You will need this figure later, too.

Now, using Ohm's Law, meter resistance and full scale current, determine the voltage drop across the meter. *Write this figure down and save it.* You'll need it later as well.

Suppressed-zero, expanded-scale

A zener diode, D3 in **Fig. 1**, is used to suppress zero so that the meter cannot indicate until the zener voltage is reached. Because your operating voltage is usually 12 to 13.8 VDC, and a fully discharged storage battery has a terminal voltage of 10.5, an 11-volt zener is recommended.

Assuming an 11-volt zener is used, and 16 volts is a bit higher than any you will use in the station, what you will have is a 5-volt meter that measures only the five-volt span between 11 and 16 volts. Using Ohm's Law and the full scale current of the meter, determine the value of the meter multiplier resistance.

As an example, assume your meter has a full-scale current of 500 µA (0.0005 A) and you want to measure the above mentioned voltage range between 11 and 16 volts:

$$R = E/I = 5/.0005 = 10{,}000 \text{ ohms.}$$

You would probably use a 10k trimpot in series with 2k or 3k fixed resistor for R3 in **Fig. 1**. Applying 16 volts across the meter, D3 and R3 in series, adjust the trimpot for a full-scale indication on the meter. Or simply measure the voltage of your station power supply fed across this series arrangement and adjust the trimpot so the meter indicates the same as your station power supply does.

Making the shunt

Now you will need the full-scale voltage drop you measured earlier. But first, what is the actual maximum current either rig is expected to draw? Add one ampere to this figure, round it off at the nearest higher figure, and write this number down. Assume your final figure is 5 amperes.

Now pull out the *Handbook* and look up the copper wire table. I'll tell you now that AWG 22 is fine for a 5- or 6-ampere shunt. Look over across the table under "Ohms per 1000 Feet." Divide this down to determine the resistance of *one inch* of AWG 22 wire. It happens to be 0.0013 ohms, and four decimal places are more than sufficient to guarantee reasonable accuracy. With these two figures, and the meter movement voltage drop at full-scale, you will do a tiny bit more arithmetic. Assume meter voltage is 0.044V.

Parts List	
Designation	Part
BP1	Red binding post
BP2	Black binding post
C1, C4	.001 μF ceramic disc
C2, C5	.1 μF ceramic disc
C3, C6	10 μF 16 V tantalum (or 100 μF aluminum electrolytic)
C7, C8	.01 μF ceramic disc
D1	LED, green
D2	Germanium: 1N34A, 1N60, 1N270, etc.
D3	Zener diode, 11 V, 400 mW (see text)
F1	Fuse appropriate for current drawn
J1–J7	3.5 mm mono phone jack or your choice
J8–J13	DC connectors, your choice
J14, J15	SO-239 or your choice RF connectors
M1	Meter, 50 μA to 1 mA (see text)
P1	Connector to storage battery if used, your choice
R1	Shunt (see text)
R2	2.4 k 5% 1/4 W
R3	Trimpot voltage set (see text)
R4	50 k pot. RF sensitivity.
S1	DPDT center off toggle, must carry full DC current
S2	DPDT toggle
S3	2-pole 3-pos. rotary
T1	T50-2 or T50-6, 30T AWG 24 secondary. Primary is straight wire through center of core, J14 to J15

Table 1. Parts list.

R(shunt) = .044(V)/5(A) = .0088 (ohms).

Now, to determine how many inches of AWG 22 wire you will need for your 5-ampere shunt, use the following:

L (in.) = 0.0088/0.0013 = 6.769 in., or a bit over 6-3/4 inches.

You can now cut the wire a half-inch longer at each end for connection, wind it over a ballpoint-pen body, slip it off, strip and tin the half-inch ends, and solder it to a 2-terminal strip. Small stranded hookup wire is used between the shunt and the rotary switch contacts.

RF magic

The simple circuit composed of C7, D2, T1, J14, and J15 is essentially identical to that I described in my article, "Home-Brew RF Ammeter for the Shack," *73 Amateur Radio Today,* July 1998, page 29. The article thoroughly describes how it functions and why it can tell you when your RF output is as high as possible, simultaneous with an SWR as low as your ATU can get it. Because it also shows you the relative RF power going into the shack ends of your feeders, you know the antenna is radiating it—so you no longer need an SWR meter or FSM in the shack. Just adjust the ATU for the highest peak on M1 with S3 in the RF position. I incorporated this circuit into this design to make it even more valuable as a necessary part of my ham station.

A final word

All wiring that carries the full load of current should be at least AWG 14 for up to 5 amperes or less, to reduce voltage drop through the wiring. If your station is QRO you will be using larger wire—at least AWG 12.

I operate only QRP and have two main rigs, an SG-2020 and a QRP++ as a backup. Both these rigs are controlled and monitored through my Ham Station Control and Monitor, and my backup battery is a 12-volt 12 Ah gel cell.

I built this unit in a Ten-Tec TG-36 that I bought on sale a couple of years ago. It measures approximately 6" W x 3" H x 4" D and matches all the rest of my home-brew accessories and test equipment. I also have several monoband CW transceivers, and when I want to use one, it is easy and quick to plug one in to temporarily replace the QRP++. Of course, it would be simple to expand this unit to handle as many as four separate transceivers. Above that number, the needed toggle switches probably are not even manufactured.

For those of you with HF rigs interested in the HF satellites, having two rigs ready at the same time with one on 10 and one on 15 meters would allow you to have a pretty inexpensive satellite station! It's a thought.

Number 42 on your Feedback card

Above & Beyond

VHF and Above Operation

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Restoring older multimode radios for microwave IF systems

Have you ever been presented the opportunity at a flea market/swap meet to stand in front of a multimode 2 meter radio that did not cost several kilobucks? Well, enter the realm of older, more classic radios that contain an unusual component—a power transformer. Yes, they do exist, and not all of them run off +12 volts directly.

I remember back even further into the Swan and Atlas earlier days, when the only thing transistorized in the entire radio was the VFO circuit. All other components were electron tubes and their associated circuitry, along with the internal AC power transformer. Many of these old workhorses still can be very useful, simple, and possibly inexpensive transmitter/receiver setups for an HF or VHF station.

There are probably more HF radios around of various makes and quality, from simple CW-only rigs to some of the more advanced units that sport SSB operation. The golden rule is that as long as the chassis is not corroded or rusty, restoration should not be a difficult project. The pursuit of antique radios capable of CW, AM, and SSB is fun, and the operation of a classic-style station can have its rewards.

I have good hunting grounds here in southern California for finding many of these older radios, partly due to the fact that several manufacturers were located about 40 miles north of my home here in San Diego. Swan Electronics, later to become Cubic Electronics, along with Atlas Electronics in Oceanside CA, and Southcom in Escondido, and a few others provided amateur and military communications equipment. In those days (1970s), we could dig into the surplus material from manufacturing and try to assemble enough parts to assemble a complete HF transceiver.

Well, today, years later, the parts are not available like they used to be, but the radios still surface at flea markets and swap meets to tempt our desire to give them another breath of life. What, then, can you resurrect from these older radios, especially the early solid state 2 meter multimode rigs of many years ago?

The popularity of these early multimode radios is not high, because they are devoid of tone control to access repeaters while using FM operation. All the other basic functions such as repeater offset and simplex operation may be standard, but these are the only frills found in these early radios. SSB, CW, and AM operation are normal, in addition to FM, making for a full function radio still quite useful. Yes, you can add an outboard tone control to make use of these radios on repeaters, but I suspect that most of us have a more versatile 2 meter FM radio for that function.

My eyes usually see a great and inexpensive IF system for use with a microwave converter. This option allows simple modifications to customize a transceiver for converter use without spending a lot of hard-earned bucks. Besides, who wants to cut into and modify an expensive newer multimode transceiver just for a microwave converter IF system? Sure, I have some real classy multiband, multimode transceivers, but I would not think of modifying my ICOM-820 2 meter-3/4 meter multimode radio for an IF system. It cost too much and works just fine as it is.

The swap meet/flea market source is usually a very inexpensive one for these older transceivers, and the cost paid usually will not put a crunch in your budget. Depending on condition and a few other things to watch for in evaluating a swap meet rig, I have found the price to be in the $100-or-less price range.

As an example, while writing this column I decided to see if I could follow my own advice and try to find a 2 meter multimode radio to restore for use as a microwave IF system. It took about 2 weeks, but at our local electronics swap meet I found a 1970s solid state Kenwood TS-700A 2 meter multimode radio. Now comes the wrangling and reasoning between buyer and seller. The seller wanted big bucks for the radio and would not negotiate to something reasonable.

Here is where the rock and the brick wall can form a formidable obstacle if reason doesn't take place. First, if the radio is equipped with microphone, power cord, and manual, and all are presented in a neat package, possibly with some modification equipment the owner has invested in, it might take more bucks to loosen the grip on this radio than the original estimate of $100.

However, if the radio is sitting on a box with an accessory cord cut off short and no accessories or even a schematic or microphone, there is room for haggling. Try asking how the radio functions and if the seller has the accessories. If there are no accessories, the radio just as well could be dead or alive—it's in an unknown condition. Now there is some room for haggling on the price to reach a mutual understanding.

If it's still on the high side or top dollar is wanted, see if you can try it out and get a refund if it's dead. If that doesn't work, make an offer at a lower figure if you're still interested, considering that both of you are looking at an unknown piece of equipment and the lower price might be a better compromise for both of you.

In my case, this exact scenario resulted in a reduction from $150 to $90. The Kenwood TS-700 looked in clean condition (dusty from a poor storage or operation environment), but otherwise it was basically intact and without any accessories.

Now, on the bright side of things I knew before I purchased this radio that I had a copy of the manual in my file cabinet at home from a long ago repair job for a friend, a plus from the start (if I could find it).

Well, getting home and powering up the radio proved troubling at first. The radio powered up OK, but most of the pilot lights were burnt out on dial indicators and knobs, making nomenclature difficult to see. It transmitted OK, but on closer examination was on frequency at the first 100 kHz of the VFO range and then went off into the blue as the VFO frequency was raised 300 to 500 kHz higher. The spectrum analyzer showed the radio trying to function at 120 MHz rather than 144 to 148 MHz. Additionally, the receiver on FM was dead, although SSB, CW, and AM (yes, AM) functioned but had the same frequency disparity on transmit.

After a few hours not totally devoted to this project, I determined the VFO and crystal oscillator mixer circuit to be the culprit. The VFO tuned a 1 MHz portion of an 8 MHz frequency and was mixed with a crystal in the 120 MHz range along with a 10.7 MHz IF to produce 2 meter frequencies. My trouble was the VFO itself, as it died between +200 kHz and +900 kHz of its 1 MHz tuning range. Outside of this range, it functioned OK. I dreaded pulling the

VFO, as it meant removing the front panel and using probably two packages of stickers to identify leads that would have to be lifted to gain entry into the shielded VFO compartment.

I went to bed thinking about how to fix the VFO with external units or whatever. Playing with the radio the next morning, I discovered that some frequencies higher in the VFO tuning range would pop up and function normally for a short time. On extended evaluation, it was determined that the VFO mechanism must have been a sort of roller inductor. Its operation was slowly restored by rapidly rotating the VFO dial back and forth until I got tired of turning the dial back and forth about its full range.

The internal mechanism must have had a corroded or dirty contact surface that was restored by rotation of the VFO tuning dial. The operation very similar to when a dirty potentiometer needs the same contact surface cleaning. After this wiping action, total restoration of the VFO dial calibration was observed (very lucky here).

Further examination led me to use a small, soft brush to remove a layer of dust and soot that had built up over the years on top of the inside PC boards of the radio. It seemed that the radio had been in a hostile environment for some time, and sawdust and other stuff had been allowed to settle through the vent holes in the top of the radio's cabinet.

Well, all this cleaning up and repair proved that I had made a good purchase of an inexpensive multimode radio. Sure, it needed some tender loving care and touch-up. But compare that investment to purchasing a new multimode radio, and I am sure you then might want to take the plunge to restoring an older radio, possibly saving quite a bit, and investing in your repair ability.

Now that (in my test example) my old 2 meter multimode radio is functioning, some modifications need to be made to make it suitable for microwave converter operation. The most important modification can take one of two turns. One is the reduction of the high power transmitter output to a lower level more suitable for microwave mixers. With a radio capable of outputting 10 watts of power, either a high power attenuator or RF antenna switching modification must be provided for. Another possibly simpler modification is to make an attenuator of very low power ratings out of 1/4 watt resistors and place it in the driver-to-final amplifier circuit.

To me, a modification using only three 1/4 watt resistors seems least intrusive and very simple. It involves unsoldering one coax cable center conductor in the amplifier compartment and inserting the attenuator between the unsoldered pin and now-loose coax center conductor and ground. I constructed a 15 dB attenuator and reduced the final value to obtain 100 milliwatts of output RF. This 100 milliwatts (+20 dBm) of power is more suitable for most high level mixers. In my case, my 10 GHz converter is located over 100 feet from my ham shack. Even considering the feedline loss and 10 dB protection attenuator before the mixer at the converter, it still provides a good +10 dBm for mixer action.

Loss Pad	R1	R2
5 dB	14 Ω	82 Ω
10 dB	26 Ω	35 Ω
15 dB	35 Ω	18 Ω
20 dB	41 Ω	10 Ω

Table 1. This is a chart of different attenuator resistors should your circuit need a different dB loss pad. See ***Fig. 1*** *for R1 and R2 pad resistor values. Use 1/4 watt carbon resistors. While values quoted are not standard, approximate values will work quite well.*

At this low power modification level, the last thing you want to do is overpower a mixer. These mixers are the precious items used in constructing converters for our upper microwave bands. As such, whatever protection you can give them through modifications such as power reduction of transceivers makes

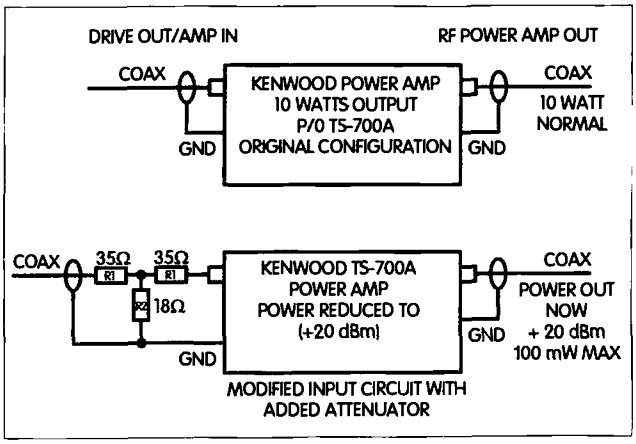
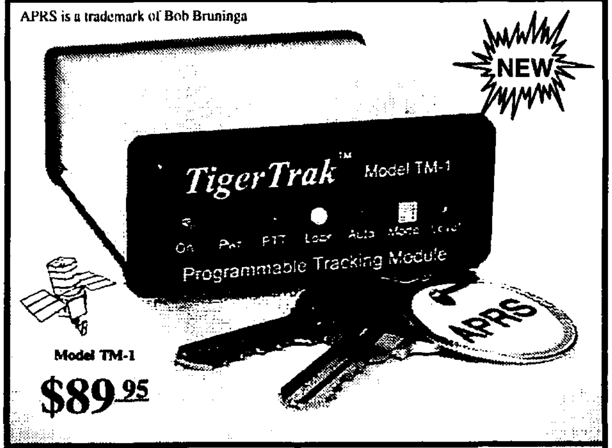


Fig. 1. Low power modifications shown in the driver-to-final amplifier compartment in the Kenwood TS-700A 2 meter multimode transceiver. Just a simple 15 dB attenuator constructed from three 1/4 watt carbon resistors completes the modification. This reduces power to the (+20 dBm) 100 mW maximum power output from the transceiver. This low power range is suitable for use with a high level microwave converter mixer circuit. If using low level mixers (+10 dBm), increase pad to approximate 20 dB loss for these mixer circuits.



Number 44 on your Feedback card

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Mobile, Portable and Emergency Operation

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It is quite interesting to write about preparation for a particular disaster rather than disaster preparation in general. The Y2K bug presents us with this unique opportunity to focus on a particular emergency with certain expected outcomes and an assumed time frame. So, assuming that the Y2K event requires our assistance, what should we be doing to prepare?

Operators

Determine who will perform various key functions, especially command and control. Key functions include net control, liaisons with various agencies, who will be assigned various locations, etc. In any disaster, it is key that the served agencies know who their assigned hams are and what they are prepared to do. For many agencies, these people must be pre-approved by the served agency. Police departments routinely require background checks before granting access to internal areas of their facility. Such access is only available to those with identification cards issued by the department. Now is the time to determine what your served agencies require and take care of the requirements now. Incidentally, don't be surprised if a served agency wants the hams to operate the agency's radio equipment rather than use amateur gear. Determine what the requirements will be, and then determine how communications needs will be met if the primary systems should fail.

Don't think of backup systems only in terms of equipment. In any situation that lasts over a few hours, people will need to be relieved and replaced. Some may be able to take time off from work to assist, but that will be for a limited period. People who are available or who have flexible schedules cannot work indefinitely. Assign a second duty section to relieve the first responders with some planning as to when this should occur. Interestingly enough, it may be prudent to hold some of the key operators back for the second wave, since the immediate responders may spend some time in the "hurry up and wait" mode while the overall situation is assessed and others switch from routine to disaster mode. Also, some hams need to be kept available to be assigned as needed for those unexpected "other duties as assigned," provide transition coverage, etc.

Frequencies

Determine which frequency (or more likely, frequencies) will be used. Do all the involved hams know the frequency to which they should report? While it is possible to have all hams report into the main frequency (sometimes called the backbone net or command net), it may make sense to have them report to a secondary one. While support communications is underway on the main frequency, operators can be checked in and given their assignments and frequencies on another. This makes the hams' organizational efforts transparent to the served agency.

Often the primary frequency is a particular repeater, but that repeater may not be available. Do the local hams know what alternate frequency to use if the repeater is unavailable? In my area, there is a very fine repeater that I expect will be functional on New Year's Eve. It is also the target of malicious interference so that even if it works perfectly, it may not be useful. If it is not available, valuable time can be lost while people search for the emergency net. Depending upon the needs of your served agencies, you may need to plan for a number of local frequencies. In a typical emergency, these may include some of the following:

1. Command and control
2. Amateur operator check-in
3. Shelter communications
4. Inter-agency liaison
5. Disaster assessment or other on-site communications
6. Frequencies for each particular served agency
7. Relay frequencies

In addition, with current technology the following frequencies may need to be designated:

1. Packet or APRS in support of the emergency
2. ATV

There would also be the potential need to communicate outside the local area via the HF bands, but that would follow behind the local operational requirements. These would include:

1. Requests for materials and supplies
2. Coordinating efforts over larger areas
3. Health and welfare

One of the problems frequently encountered in emergencies is the loss of a particular local frequency. In most cases, this is coincidental with the loss of a repeater. While the loss may be catastrophic, it usually is due to either the loss of backup power or pure overcrowding. This is one reason that alternate frequencies are so important. It is better to split the communications among several frequencies

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good engineering sense. I have always felt that it was unreasonable to generate all that 10 watts of power only to use a high power attenuator to reduce it.

Besides, reducing the power beforehand saves in power supply heat through lower current required to function. Making the rig run cooler is another big plus in overall operation.

Was the old rig restoration work worth all the fuss I went through? You bet. Not only did I get a good unit back in service and fully restored through the application of a little elbow grease, but I also saved the ICOM 820 for other uses and enjoyment. I think it would be pound foolish to modify such an expensive quality multimode radio just to use for a converter application.

There are many other types of 2 meter and even 450 MHz radios that will fill the bill. For instance, the Yaesu FT-480 and FT-780; the ICOM IC-211, IC-245, and IC-260; and for SSB only, the IC-202 and IC-402. These are just ones that I have observed in common use here in southern California. Power modifications and operation will vary, of course, on different units; each will have to be evaluated on an individual basis.

Next time I will cover some of the fine points on the IC-202 SSB VXO-controlled 2 meter transceiver. This unit is another natural for microwave converter use. A bonus point on this radio is that it has a direct readout mechanical dial that is visible even in bright sunlight.

Here's good hunting at swap meets and flea markets in your quest for that bargain multimode transceiver. Just try to avoid paying too much without full knowledge of what you are getting into with a questionable radio. If the price is low or a big bargain, I would take the plunge and give it a try. After all, we are trying to shop at bargain prices and save some bucks. Best 73 and good hunting. Chuck WB6IGP.

than try to run everything through a single frequency. Another basic to remember is that although there is a desire among hams to get on the air and talk, during an emergency the less said, the better. If you have something important that needs to be transmitted, then send it. Otherwise, it's best to monitor only. This extends the life of the battery in your handie-talkie as well as the repeater if it's running on battery power. It also keeps the frequency available for critical traffic.

If there are power interruptions, repeaters will only work so long and then their backup power will be exhausted. When that happens, it may be necessary to provide wide area coverage by other means. At least some of this can be addressed prior to January as part of the planning process. In most cases, the population centers will be the areas that need to be served as well as the served agency locations. Can these areas communicate directly on a simplex frequency? If not, what alternatives exist? There are several that can be included in the emergency planning:

1. Portable repeaters are available that can be quickly deployed. They may constitute a significant expense even though the repeater will rarely be used, but they sure can be useful. Since we cannot predict which repeaters will be operational and which might fail, these should not be rockbound to a given frequency and should be equipped with a good source of backup power.

2. Some radios can crosslink between 2 meters and 440 MHz to act as a repeater. Of course, it is necessary that the signal eventually ends up on a frequency that most involved operators can receive. This may involve converting from 2 meters to another frequency band and then converting back to 2 meters.

3. Simplex repeaters are available that use a digital chip to store a message which is then immediately retransmitted.

4. As amateur radio operators, many of us are members of the ARRL. The third letter of this stands for "relay." In many cases, the easiest and most practical method of extending range when a ham who can copy the initiating station relays the traffic to another relay point or to the recipient. This technique, while definitely low-tech, can be quite effective. I recommend that if significant amounts of traffic must be relayed, a relay frequency be designated.

If there ever is a time to plan on operating at the lowest level of power practical, this is the time. Likewise, placing a temporary or simplex repeater or a relay station in a good location can extend the life of the system. A system that runs out of juice before the operator needs to take a comfort break is of dubious value. 73

If you're a No-Code Tech, and you're having fun operating, tell us about it! Other No-Code Techs will enjoy reading about your adventures in ham radio—and we'll pay you for your articles. Yes, lots of nice clear photos, please. Call Joyce Sawtelle at 800-274-7373 to get a copy of "How to Write for *73* Magazine."

Number 46 on your Feedback card

The Digital Port

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My interest in the Creative Services Software programs mentioned last time was piqued when I received a message from Rick Ruhl, president of the company, saying that they not only were producing packages for Timewave products and Kantronics, but also developing Windows programs for MFJ, SCS, and Hal. I know there are hams interested either in alternatives to original packages or because they have acquired used TNCs with no software.

First, let me say that the software I sampled works and is easy to install. That last is important to most hams—we want to get the program plugged in and running so we can play. That is supposed to be the meaning of Plug 'n' Play, but all too often new software is dubbed "Plug and Pray" by the disgruntled would-be user.

And in the event you need help, the company has technical support to get you up and running. I was at an advantage because my old PK232MBX has been playing beautiful tunes for years. Communication between the computer and the '232 have long since been established. There are detailed instructions to follow when that is not the case, such as with a new unit/software combo.

Speaking of instructions, in my efforts to be thorough, I downloaded the operating manual and printed it. The manual formatted nicely for my Word program and turned out to be a 212-page document! I figured if there was that much to write about this program and the associated TNC, there must be something in there I didn't already know.

However, it turned out there was a lot of blank paper space and I would have been smart to edit out many of the page breaks before printing. I didn't do this because there is a nifty index in the back of the manual and I wanted the page numbers to be relevant. When I mentioned this to Rick Ruhl he explained their automated system brought the text forward from the help files and they have, since that time, edited the manual to a much shorter edition.

In the case of the PK232, there are a lot of parameters that may require tweaking for best performance (or any performance). The good part about setting up the PKTerm software is that it is practically ready to communicate with the AEA unit. During boot-up, it checks for the model of hardware and any built-in updates, so it "knows" what it is dealing with and adjusts appropriately.

There is a screen available when the packet screen is in view, known as the command box, that allows change of the parameters of the PK232. Somehow, I hadn't needed, and consequently hadn't noticed, this convenience until I was on the phone with Rick. It was sitting right there in plain view all the time, but only when the packet screen was up. The HF screen does not show this box, and I was more interested in the HF capabilities of the program.

One of the pleasures of using something new shows itself when it works "right out of the box." That is what the program did for me. There was one negative factor that I fixed. I later decided, while speaking to Rick, that it must be a problem related to using the 256-color monitor. The problem was that the default font was very distracting to the eyes because the letters and symbols were just too "fat" and too close together.

These dinosaur monitors are becoming relics, and even *I* will have to upgrade sometime soon. Of course, bear in mind that not only am I frugal, but also it is only a little over two years since I decided that 16 colors weren't getting the job done.

A very nice feature of PKTerm99 made a myriad of fonts available as well as a selection of colors for background and text. After a little experimenting, I found that the "Courier New" font at 11 points was nearly ideal. I chose colors that were pleasing to the eye and the whole program looked much better. Even reduced the noise level of the user. This may be of interest to the frugal set.

There are 10 user-definable macros. I used two of them to write CQ files for PACTOR and RTTY. You can find a number of uses for macros. Most hams have a brag file to list their station equipment and, of course, macros are invaluable for contestors. They are easy to write or edit and available at the click of your mouse. The instructions include an example of writing a real macro that automatically plugs in information from the computer and your input to automate the first round of a QSO. A thoughtful bit of advice.

What I like about the macro pull-down is that it displays the descriptive title I gave the two macros I wrote. After a quick glance, I merely need to hit Control and a number key to bring the macro into the composition or "chat" screen. Very friendly.

I questioned Rick about the flagrant display of buttons for AMTOR instead of one of the more "advanced" modes. Then I mentioned to him, in almost the same breath, how I had recently heard a ham linked in AMTOR in just the past few days. Very unusual. Rick explained that a lot of marine uses for the Timewave hardware still use SITOR, which justifies the prominent display of the old mode.

One of the pluses Creative Services Software has going is that they are working closely with the various hardware manufacturers such as Timewave. I accessed the Timewave Web page to see their positioning and found an announcement I had not considered, that the program is Y2K compliant. Nice to know.

This version of the program is said to work with most any current AEA/Timewave hardware or that which is expected to be still surviving. I saw model numbers listed that I was not aware of. So, if you have an old AEA unit you could find a use for, you should check the Web site of either Timewave or Creative Services Software. (See chart.)

Speaking of modern ham communications features, I have been using programs with DSP or working the '232 with the Timewave DSP-599zx hooked up. When I started testing this program, the 599 was not hooked in line. I wanted to experience the "feel" of the barebones '232.

There is a difference. I had to think back a bit to when I first started using the '232, about 9 years. It is old enough that I installed the '93 update that enabled the use of PACTOR. That, incidentally, seems to be about the time of the demise of AMTOR on the ham bands, which I mentioned earlier.

I still recall the thrill of making AMTOR links. I had previously worked some HF packet. Packet, keyboard to keyboard on HF, was never much fun because of the high collision rate. A packet could take five to ten minutes to gain acknowledgment. I don't know if anyone does that sort of thing anymore. I recall one such contact I made on 30 meters a few years ago, but it looks like the chief use of HF packet is for bulletin boards, and I see many HF BBSs are now using PACTOR.

Current Web Addresses

Source for:	Web address (URL)
HF serial modem plans + software	http://www.accessone.com/~tmayhan/index.htm
SV2AGW free Win95 programs	http://www.forthnet.gr/sv2agw/
BayCom — German site	http://www.baycom.de/
Pasokon SSTV programs & hardware	http://www.ultranet.com/~sstv/lite.html
New Mode — PSK31 — Free download	http://aintel.bi.ehu.es/psk31.html
Baycom 1.5 and Manual.zip in English	http://www.cs.wvu.edu/~acm/gopher/Software /baycom/
Source for BayPac BP-2M	http://www.tigertronics.com/
TNC to radio wiring help	http://prairie.lakes.com/~medcalf/ztx/wire/
ChromaPIX & DSP software	http://www.slliconpixels.com/
Timewave DSP & AEA products	http://www.timewave.com
International Visual Communication Association — a non-profit organization dedicated to SSTV	http://www.mindspring.com/~sstv/
XPWare — TNC software with sample download	http://www.goodnet.com/~gjohnson/
Auto tuner and other kits	http://www.ldgelectronics.com
TAPR — lots of info	www.tapr.org
Creative Services Software	www.cssincorp.com

Table 1. Handy URLs.

I was curious about the HF packet ability of the PKTerm99 package. It wasn't evident that that was an option until I checked the help menu. There is a setup screen to change to 300 baud. Just a few clicks and I tuned one of the packet BBSs and it copied. Good enough for me. I know it works.

Back to the DSP thoughts. For PK232MBX users, Timewave is providing an upgrade that adds DSP to this remarkable old workhorse. For about $125, you can have the controller that does everything and pulls the weak ones out like never before. That is a must for this shack.

Even though I can run the Timewave DSP unit ahead of the '232, I am starting to be swamped with special cables and am forgetting, often, what goes where. Some pretty embarrassing mistakes are happening. That would clean up some of the mess. Of course, there is something to be said for neatly labeling all cables and making sensible notes, kept in a neat and orderly spot on the shelf (which is already inundated with previous attempts at orderliness).

A point of interest for PK232MBX users: If the software shuts down with the wrong parameters, another program may not be ready to pick up where the other left off. We get so used to so many software intense systems that seem to take care of themselves that we sometimes forget that the terminal node controller (TNC) "remembers" parameter variations we send to it via the software.

I have been using the XPWare software that I reported on in this column a good while back. These two programs don't mess each other up. That is good to know. It is also good to know that the problem can give you fits when installing a PKTerm99 as a replacement for some older software.

The previous software may have left your TNC in a disagreeable startup state for the new stuff. I didn't discuss this with Rick, because I had experienced no problem. So—I wouldn't accept this as a given, but I wouldn't be surprised if the PKTerm99 inserts the necessary parameters to establish the protocol between the computer and your TNC "no matter what." If you should experience a problem, this is what the tech support they offer is for. You will get it going.

The Kantronics version of the program is said to look and feel the same as the one I have just discussed. As a matter of fact, the intent is to make a user-friendly environment for the users of all the popular TNCs on the market, along with many of the older and discontinued units still in service.

Where credit is due

My first contact on the PSK31 mode, as reported last month, was with Bill WA4KBD. I am still indebted to Bill for his thoughtful insight concerning the new mode. Last month, I was away from home and could not recall Bill's call. When I returned home, I went to Bill's excellent Web site at [www.missionradio.net] and retrieved the QSL he promised would be there.

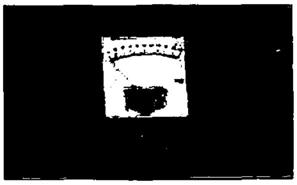
I printed the "card" and it is excellent, especially when done in color. One more reason to set up my own Web site. I am just going to have to quit loafing, make up my mind, and do it. That QSL probably took very little more effort to post than a regular card, required no postage, and delivery could have been in minutes. Impressive.

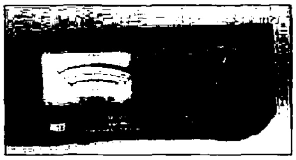
So many toys—so little time

I mentioned last month that I have a beta copy of the DSP (there's that stuff again) soundcard program from the author of ChromaPIX. I will get that up and running and tell you all the wonderful things I see (and don't hear) next month. This sounds like a real winner. I have a lot of questions about such a device and am anxious to see what Jim Barber has accomplished here.

If you have questions or comments about this column, E-mail me at [jheller@sierra.net] and/or CompuServe [72130.1352]. I will gladly share what I know or find a resource for you. For now, 73, Jack KB7NO.

New Products





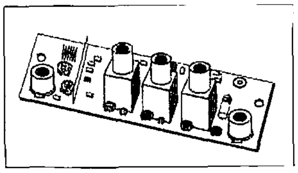
Mini News from MFJ

• MFJ's super compact field strength meters fit in the palm of your hand or your shirt pocket. The MFJ-801 ($19.95) lets you read relative field strength from your antenna, measure antenna performance, and find out how strong your antenna field is. The MFJ-802 ($39.95) is a bipolar model that can also be used remotely.

• MFJ power strips power different combinations of rigs and accessories with convenience and safety in mind. Models MFJ-1112/1116/1117/1118 range in price from $29.95 to $69.95.

• Their GrandMaster™ series of SWR/power meters features an SWR scale that expands the full view of the meter. 3:1 SWR is centered at mid-scale to give you precision and wide-range measurements. All include peak and average forward and reflected power readings, and have selectable power ranges. Models MFJ-870/872/873/874 range in price from $94.95 to $169.95.

For further information about these or other MFJ products, contact MFJ Enterprises, P.O. Box 494, Mississippi State MS 39762; tel. (800)-647-8324; E-mail [mfj@mfjenterprises.com]; site [www.mfjenterprises. com].



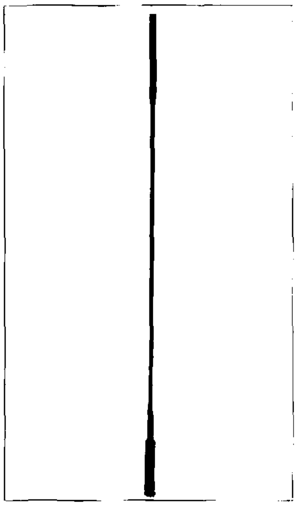
New Hamtronics Preselectors

If you have intermod problems with a VHF receiver, Hamtronics may be able to help eliminate them! Adding just a filter ahead of a receiver may block the interfering signals, but it will degrade the sensitivity of the receiver because of its insertion loss. However, Hamtronics' new LNP series of preselectors has been designed with a low-noise preamp ahead of the filter to establish a low noise figure before the signal reaches the filter.

Models are available for all popular bands from 132 to 180 MHz, including the 137 MHz weather satellite band and the 144 MHz ham band. $39.

For further information, contact Hamtronics, Inc., 65 Moul Rd., Hilton NY 14468-9535; tel. (716) 392-9430; fax (716) 392-9420; E-mail: [jv@hamtronics.com]; site: [www.hamtronics.com]. Don't forget to mention 73!

Natcomm MH-510 HT Tribander Antenna



NCG Company has developed an upgrade antenna for the popular Yaesu VX-5R and ICOM IC-T8A multiband handhelds. The Natcomm MH-510 produces an excellent signal on 6m/2m and 70cm. Electrically, it is a top-loaded quarter wave on 6m, a quarter wave on 2m, and a 5/8 wave on 70cm. It comes with an SMA connector, eliminating the need for an SMA-BNC adapter, and is 20-3/4 inches long. $37.95.

For further information, contact NCG Company, 1275 North Grove St., Anaheim CA 92806; tel. (714) 630-4541; fax (714) 630-7024; E-mail [micks@cometantenna.com].

Soldering Catalog from Antex

A new catalog that features a full line of miniature and standard soldering irons, temperature control stations, and stands, plus a wide selection of tips, is being offered by M.M. Newman Corporation. Built for optimal thermal efficiency, all Antex irons are designed with the heating element located under the tip, resulting in faster heat-up, quicker recovery time, and cooler handles. The 8-page catalog includes 40 different slide-on tips, a 60 W hot knife, 12 V auto repair kit with an iron that clips onto a 12 V battery, and a number of stands.

For further information, contact M.M. Newman Corp., 24 Tioga Way, Marblehead MA 01945; tel. (781) 631-7100; fax (781) 631-8887; E-mail [mmn@mmnewman.com]; site [www.mmnewman.com].

Print Screen is Back!

New Print Screen Works software for Windows 95/98/NT lets users print, E-mail, or fax anything that's on their screen simply by pushing the long-dead Print Screen button. Once captured, the image can be printed or converted into a .bmp or .jpg file. It can capture images that fill the whole screen, the active window, or just a portion of it. Print Screen Works also includes a built-in Internet E-mail capability—you can send an image directly from your computer screen to anyone else's via E-mail. $29.95.

For further information, contact SilverLakeTech.com, 55 Washington St., Bloomfield NJ 07003; tel. (973) 259-9300; fax (973) 748-3015; E-mail [joel@silverlaketech.com]; site [www.silverlaketech.com].

Number 50 on your Feedback card

HAMSATS

Amateur Radio Via Satellites

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Houston TX 77083-5640

SUNSAT-OSCAR-35 is up and running, and sounds *great!* During the first weekend in July, ground controllers in South Africa configured the amateur-radio portion of S-O-35 for analog, cross-band repeater operation. They set the satellite for "Mode-B", with an FM uplink on 436.291 MHz coupled to an FM downlink on 145.825 MHz.

Since the launch of Stellenbosch University's new satellite on February 23rd, the students and supporters of SUNSAT have been busy checking out and calibrating the onboard systems, stabilizing the spacecraft and starting experiments. A detailed description of the satellite can be found in the June *Hamsats* column.

Less than a month after the launch, an historic contact between longtime project enthusiasts Garth ZR1AFH and Hans ZS5AKV took place via S-O-35. General ham activity has finally made it to the satellite's schedule, but the wait was worth it. The single-channel FM repeater on S-O-35 is fantastic. While it can be set for two meters up and 70-cm down (Mode J) like A-O-27, it was instead configured like A-O-21 with a 70-cm uplink.

A-O-21 was a subsystem of RS-14. One of its many capabilities was to emulate a simple "bent pipe" Mode-B (70-cm up and 2-meters down), cross-band FM repeater. A-O-21/RS-14 is no longer on the air, but while it was active, the single-channel repeater mode became very popular since it could be worked with a dual-band handie-talkie. The same is true for S-O-35. The 70-cm receiver is quite sensitive and the two-meter transmitter's lowest power setting is one watt, still plenty of power for easy HT or scanner reception.

Due to power-budget constraints, the repeater can only be activated for limited periods. The students at Stellenbosch University run their experiments during the week and then, working with the satellite ground controllers, set up onboard timers for amateur-radio transponder operation on Sundays. The schedule is usually announced via the AMSAT-bb E-mail remailer, (details on how to subscribe can be found at [http://www.amsat.org]) or on the SUNSAT web site [http://sunsat.ee.sun.ac.za].

Photo A: Andy W5ACM makes contacts via A-O-10 and other hamsats while on a fishing trip in central Texas.

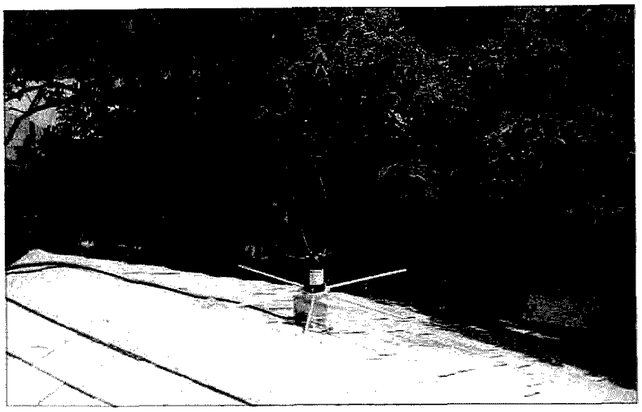

Photo B: *Satellite antennas for the fishing trip were very simple. This 70-cm "Eggbeater" did well when used with a 2-meter Ringo Ranger.*

When the transponder turns on, it starts with a stream of 1200-baud AFSK data on the downlink transmitter before going into voice mode. The repeater operation starts as soon as the data stops. Due to the complexity of the ham gear on S-O-35, the satellite can be moved to many different frequencies within the two meter and 70 cm amateur satellite bands. A single-frequency "parrot" repeater can also be activated on 145.825 MHz. It listens for eight seconds, and then transmits what it has heard for the next eight seconds. The cycle repeats for as long as the parrot is active. S-O-35 also has packet store-and-forward message capabilities. It may be a while before all of its systems have been tested, but it will prove to be a lot of fun for those that keep up with this fine hamsat.

Other portable pursuits

It has been said that all of our current hamsats can be worked with simple portable or mobile systems, with the exception of AMSAT-OSCAR-10. A-O-10 had its 16th birthday in June. The onboard computer is dead and the satellite's attitude is uncontrollable, but when the solar panels are properly illuminated, the Mode-B transponder works fine for CW and SSB contacts. On a recent fishing trip, I decided to try A-O-10 with a Yaesu FT-847 and some very simple antennas.

For the 70-cm uplink a small M-Squared "Eggbeater" was placed on the roof. A Cushcraft Ringo Ranger (always at the lake house) was used for two-meter reception. While the satellite was at its high point, or apogee, signals were barely detectable, but during a low point, or perigee pass, reception was fantastic. A- O-10 sounded like a LEO (low earth orbit) hamsat, but even its perigee is much higher than the "tallest" LEO amateur-radio satellite. It's quite common to catch some good DX via A-O-10. With 10 to 50 watts out to the Eggbeater, voice contacts were easy, most with "armchair" copy. My car antennas would have worked as well, and an Arrow hand-held, dual-band Yagi would have outperformed both installations.

The popularity of the Arrow antenna continues to grow. This rather simple dual-band Yagi is designed with satellite chasing via AMRAD-OSCAR-27 as its primary use. The antenna comes apart very easily for storage and shipping. It is made of aluminum arrow shafts and is available with an optional low-power

Number 51 on your Feedback card

Calendar

Listings are free of charge as space permits. Please send us your Special Event two months in advance of the issue you want it to appear in. For example, if you want it to appear in the December issue, we should receive it by September 30. Provide a clear, concise summary of the essential details about your Special Event.

AUG 21

ITHACA, NY The Tompkins County ARC announces its 1st annual Finger Lakes HAM-IN (hamfest and fly-in) at Tompkins County Airport (KITH), 3 miles NE of Ithaca. Large hangar for indoor vendors and displays. Paved outdoor flea market and parking. Airplane rides and aviation displays. Breakfast and lunch served. Admission $5, under 18 free. Indoor tables $10; outdoor spaces $2 each. VE exams, pre-registration preferred. Talk-in on 146.97. Contact *Richard Spingarn, (607) 387-5251*.

LONGVIEW, WA The Lower Columbia ARA, W7DG, will sponsor its 8th Annual Ham Radio, Computer and Electronic Equip. Swap Meet 9 a.m.–1 p.m. at the Cowlitz Co. Expo Center in Longview. Admission $3. Tables $15. Tailgate spaces $5. Free parking, overnight RV parking on the fairgrounds for $12. Electrical hookup available. No VE exams. Vendor setup on Fri., 5 p.m.–9 p.m.; Sat., 6 a.m.–8:45 a.m. Talk-in on 147.26(+), PL 114.8. Take Exit 36 or 39 off Interstate 5 and follow the signs west for the Expo Center (or fairgrounds). Mt. St. Helens and the Oregon coast are nearby. For more info write to *LCARA Swap Meet, P.O. Box 906, Longview WA 98632;* or call *Bob KB7ADO at (360) 425-6076, in the evening. E-mail [kb7ado@aol.com]*. Link to flyer online at *[www.qsl.net/nc7p/]*.

WARSAW, IN The Kosciusko Co. Hamfest Computer Show will be sponsored by the Hoosier Lakes Radio Club, Aug. 21st, at Kosciusko Co. Fair Grounds in Warsaw, 8 a.m.–2 p.m. Radio, computers, software, electronic parts, indoor

Continued on page 52

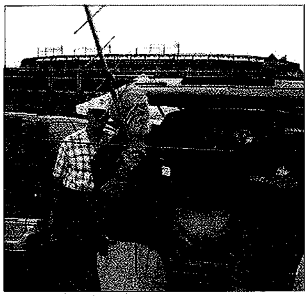

Photo C: *At the Arlington, Texas, Ham-Com '99, Gerald KK5YY demonstrated an Arrow dual-band, hand-held Yagi for A- O-27 operation.*

duplexer that fits in the handle for use with dual-band HT's. It can be hand-held (a true "Armstrong" rotator) or mounted to a camera tripod. Several that bought this antenna for A-O-27 activity have found that it also does very well with the Japanese Fuji satellites, some portions of A-O-10's orbit, and now S-O-35. The Arrow antenna is not cheap, but you can find out more at the web site: [http://hometown.aol.com/Arrow146/index.html]. Arrow's E-mail address is [Arrow146@aol.com], and the postal address is Arrow Antenna, 1803 S. Greeley Highway #B, Cheyenne WY 82007.

A few satellite chasers have tried using the Cushcraft short dual-band antenna (A270-6S) for satellite work. It's less expensive and it does function, but could use some serious modifications to be as effective as the Arrow.

The 1999 AMSAT space symposium

It's time again for the AMSAT Space Symposium and General Meeting. Recent and future hamsat developments will be presented in San Diego, California, over the weekend of October 8-11, 1999. The event will be at the Hanelei Hotel in the heart of San Diego's Mission Valley.

If you've never been to the yearly AMSAT event, this one promises to be one not to miss. The Space Symposium will feature two full days of presentations by some of the best-known small satellite designers, builders, and software experts in the world. There are nearly a dozen new hamsat projects in various stages of design and construction. This is where to go to find out what's in store for the year 2000 and beyond.

Saturday evening is set aside for the AMSAT General Meeting, banquet, awards presentations and prize drawings. The prizes at AMSAT events are always good. We expect 1999 to be the best yet for some really serious "door" prizes.

Sunday, October 10th is the beginning of the AMSAT Board of Directors meeting, but there's a tour of the QUALCOMM Incorporated Globalstar Lab and SpaceDev, Inc. scheduled for the morning. The Board of Directors meeting will begin after the tour, since the Board members will likely be on the tour. Check out the web sites: [http://www.qualcomm.com] and [http://www.spacedev.com] for a preview of the tour sites.

To find out more about the AMSAT Space Symposium and General Meeting, check AMSAT's web site at: [http://www.amsat.org]. The on-line announcement includes numerous links to hotel information, attractions around San Diego, and the ARRL Southwestern Division Convention that's scheduled for the weekend before AMSAT on the RMS Queen Mary in Long Beach.

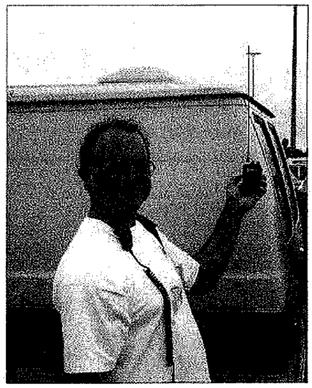

Photo E: *Mike WA5TWT tried receiving the 70-cm downlink from A- O-27 on his new Yaesu VX5R HT. It worked!*

Photo D: *James KF5WT also worked A-O-27 from the Ham-Com '99 parking lot using his modified Cushcraft dual-band Yagi.*

tables and outdoor flea market. Free parking. Overnight camping. Talk-in on 146.985(-). Inside tables, 8-ft., $10 (includes 1 free ticket). Free outdoor flea market (with ticket purchase). VE exams at 2 p.m., walk-ins expected. For more info, contact *Loren Melton WB9OST, (219) 858-9374 evenings; E-mail [WB9OST@ WAVEONE.NET].*

AUG 22

ST. CHARLES, MO "Hamfest 1999" will be held by the St. Charles ARC, 6:30 a.m.–1 p.m. at Blanchette Park in St. Charles MO. Free admission. Ample free parking. Talk-in on 146.67. A parking lot flea market will be held for amateur radio and electronic items only. $10 per parking space. For vendors inside the air-conditioned Memorial Hall, tables are $15 each. Call for availability. Contact *Ken Fieser, (314) 428-4383; E-mail [kfieser@aol.com].*

AUG 28

GARDNER, MA The Mohawk ARC, Inc., will hold their 7th Annual Ham Radio, Electronics, Computer Hamfest at the Mohawk Drive-in Theater in Gardner, rain or shine. Spaces will be reserved for those who register in advance. Sellers' hours, 6 a.m.–3 p.m., $5 per space. Mail advance registration orders to *John Dould AE1B, 22 South Athol Rd., Athol MA 01331-2722.* General admission is 8 a.m.–3 p.m., $2 per person. Directions: Rte. 2 to Gardner, take Exit 22, then Rte. 68 South to the first set of lights. Take a right at the lights onto Rte. 2A. Follow the airport signs for 1-1/2 miles. Entrance is on the left. Talk-in on 145.370 rptr.

LA PORTE, IN The La Porte ARC will host a hamfest Aug. 28th, 7 a.m.–2 p.m., at the La Porte County Fairgrounds IN, 2 miles west of La Porte. Admission $5 in advance, with this ad, or $6 at the gate. Tables $10 each. Outdoor tailgating is free. Talk-in on 146.52. Contact *Neil Straub WZ9N, P.O. Box 30, La Porte IN 46352. Tel. (219) 324-7525. E-mail [nstraub@ netnitco.net].* See their site on the Web at *[www.geocities.com/ siliconvalley/byte/1653].*

WESTON, WV The West Virginia State Radio Council will hold its 41st annual Hamfest and ARRL Convention, Aug. 28th, at the Jackson's Mill State Conference Center in Weston. Flea market and tailgate spaces available. For more info contact *Patrick Shea N8MIN, Rt. 4 Box 365F, Weston WV 26452. E-mail [wvsarc@qls. net].*

AUG 28–29

WOODLAND PARK, CO The Mountain ARC will hold a Camp/ Swapfest Sat., Aug. 28th, and Sun., Aug. 29th, at the Colorado Lions Club Camp, 4 miles north of Woodland Park CO, on Hwy. 67 North. Free admission for buyers. $10 daily to camp and/or sell. Set up camp Fri., Aug. 27th, after 2 p.m. Talk-in on 146.820 rptr. Advanced reservations requested. Contact *Wes KØHPZ at (719) 687-8758; E-mail [wlw@prodigy. net];* or mail reservations to *MARC, P.O. Box 1012, Woodland Park CO 80866.*

SEP 4

ALAMOGORDO, NM The Alamagordo ARC will host a hamfest at the Otero County Fair Grounds on U.S. 54 and Fairgrounds Rd., north end of town, across from the White Sands Mall. Indoor tables, tailgating, dealers, ARRL forum, traffic net forum. VE exams. Free admission. For more info contact *Larry Moore WA5UNO, 1830 Corte Del Ranchero, Alamogordo NM 88310. Tel. (505) 437-0145, day or night.*

SEP 10–11

QUEEN WILHELMINA STATE PARK, AR The Queen Wilhelmina Hamfest will be held at Queen Wilhelmina State Park, 13 miles west of Mena AR, on Hwy. 88. This is part of the Quashita National Forest. Lodge, restaurant, RV and tent camping. Campers, do not feed or bait the bears! Citations may be issued. There has been no danger, but leaving food out could be risky. This year's theme is "'50s Revisited." Bring your bobby sox, saddle oxfords, bow ties and other '50s memorabilia. There will be a display of '50s ham gear. VE exams. Flea market, bring your own table. For Flea Market, contact *Charlotte KC5DOR at [blee@ ipa.net].* For other info, contact *Ray W5DLC at [raysoft@intrastar.net].*

SEP 11

BALLSTON SPA, NY Saratoga County R.A.C.E.S. Assn., Inc. will hold its 14th Annual Hamfest on Sat., Sep. 11th, rain or shine. at the Saratoga County Fairgrounds in Ballston Spa NY. Gates open at 7 a.m., with the hamfest running until 3 p.m. Admission is $5, which includes one tailgate spot and free parking. A fox hunt and VE exams are also featured. Reserved tables $5 each on a first-come-first-serve basis. Reservations and pre-pay are welcome and encouraged. Early setup for all vendors. For further info and reservations, contact *Darlene Lake N2XQG, 314 Louden Rd., Box #84, Saratoga Springs NY 12866. Tel. (518) 587-2385. Packet [n2xqg@ wa2umx]; E-mail [lake@capital. net].* Talk-in on the WA2UMX rptrs., 146.40/ 147.00 and 147.84/.24.

FRANKLIN TWP., PA The Radio Assn. of Erie will present "Erie Hamfest '99 on Sat.. Sep. 11th, 8 a.m.–2 p.m., at the Franklin Twp. Firehall. From I-90: 8 miles south of Exit 4. From I-79: Albion Exit 38, Rte. 6N west for 2.5 mi. Talk-in on 146.01/.61. Free parking. Tailgating. Handicapped-accessible. Test bench available. Admission $4 each. Tables $8 each. Electric $2. Tailgating $1. For vendor registration and advance tickets, send check payable to *Radio Association of Erie, P.O. Box 844, Erie PA 16512.* Please enclose an SASE. Deadline is Aug. 31st. Vendor and tailgating setup Fri., 8 p.m.–midnight; Sat., starting at 5:30 a.m. No outside food or beverage sales permitted. Contact *Dr. Tom McClain N3HPR, 3954 Solar Dr., Erie PA 16506. Tel. (814) 833-1640; E-mail [tem@ erie.net].*

SEP 11–12

LOUISVILLE, KY The Greater Louisville Hamfest/ARRL KY State Convention will be held at the Bullitt County Fairgrounds. This is about 25 minutes south of Louisville on I-65. Tickets $7 in advance (send an SASE), and $6 at the door. Mail requests for tickets or info to *P.O. Box 34444-N, Louisville KY 40232-4444.* For commercial spaces info, call *(812) 282-7007 or (812) 948-0037.* For info regarding flea market spaces and/or tailgating, call *(502) 935-7197 or (606) 284-9090.* Visit the Web site at *[http://www. thepoint.net/~glha/].* Free parking. Limited amount of free overnight camping.

SEP 12

FINDLAY, OH The Findlay Radio Club's 57th Hamfest will be held 8 a.m.–3 p.m. at the Hancock County Fairgrounds, East Sandusky St. (Route 568). Talk-in on 147.5(+) and 444.15. Admission is $5. Tables $19 each. For further info, contact *Dave Hoxworth AA8KJ, 443 Scarlet Oak Dr., Findlay OH 45840. Tel. (419) 423-3402.*

SEP 18

MARGARETVILLE, NY The Margaretville ARC Hamfest will be held at Margaretville Firemen's Fairgrounds at the junction of State Routes 28 and 30, behind the A&P in Margaretville. Setup at 7 a.m. General public admitted at 8 a.m. Admission is $4 at the gate. Table space is $10, with tables available for an additional $5. Talk-in on 146.985. Contact *Hal Murken NQ2Y, P.O. Box 112, Margaretville NY 12455. Tel. (914) 586-3893.* Or contact *Lester L. Bourke Sr. KB2DCE, (914) 586-3186; E-mail [bourke@catskill.net].*

MT. CLEMENS, MI The L'Anse Creuse ARC will hold their 27th Swap & Shop at the L'Anse Creuse High School, Reimold St., Mt. Clemens MI (2 miles off I-94, Exit 236). Tables for new and old radios, computers and software, and electronic components. VE exams. Free parking. Admission is $1 in advance, $5 at the door. 8-ft. tables, $10 (setup at 6 a.m.). Tailgating $5. Talk-in on 146.420 and 147.080(+). Contact *Betty McGinn N8SIH, (810) 791-4484, or SASE to P.O. Box 180072, Utica MI 48318-0072. E-mail [Boops@juno.com].* Visit the club Web page at *[www.flash.net/~lcarc].*

SEP 19

ADRIAN, MI The Adrian ARC's 27th Annual Hamfest and Computer Show will be held at the Lenawee County Fairgrounds in Adrian. Tickets are $5. Trunk sales, VE exams. Contact *Brian J. Sarkisian KG8CO, (517) 265-1537 or [kg8co@lni.net].* The AARC Web site is at *[http://www.LNI.net/w8tqe].*

HAMILTON TWP., NJ "FallFest '99", sponsored by the Delaware Valley Radio Assn., will be held at Tall Cedars of Lebanon Picnic Grove, Sawmill Rd., Hamilton Twp. NJ. I-95 North to I-295 South: Exit 60A to I-195 East; Exit 2 to Yardville; South Broad St. to end, approx. 3.7 miles; left at Yield onto Old York Rd.; next right onto Sawmill Rd.; site 1.1 miles on right. Open to buyers at 8 a.m. Open to sellers at 6:30 a.m. Admission $6, non-ham spouses and children admitted free. Free parking. Tailgating space $10, includes one admission. Covered table space $15, includes one table and one admission, some electricity. Advance covered space reservations available. ARRL table. Talk-in on 146.67(-). Contact *FallFest '99, DVRA, P.O. Box 7024, West Trenton NJ 08628. Tel. (609) 882-2240.* See the Web page at *[www.slac.com/w2zq].*

NEWTOWN, CT The Western CT Hamfest will be held at the Edmond Town Hall, Rte. 6, Exit 19 on I-84. Open 9 a.m.–2 p.m. Setup at 7 a.m. New equipment dealers, flea market, tailgating, computers. Tables $10; tailgating $6 (each includes 1 admission). Admission $4 (under 12 free). Talk-in on 146.67 MHz. Contact *Jeff Cantor WB3DLG, P.O. Box 3441. Danbury CT 06813-3441. Tel. (203) 857-7050.*

SEP 25

DAYTONA BEACH, FL The ERARA and DBARA clubs have again joined together to bring you the 3rd annual Daytona Beach Hamfest and Computer Show, Sat., Sep. 25th, 9 a.m.–5 p.m., at the Embry Riddle Aeronautical Univ. campus on Clyde Morris Blvd., just 1 mile south of International Speedway. Talk-in on 147.150(+600), starting at 7 a.m. Doors open 9 a.m. sharp. Lunch will be provided at modest cost by Embry-Riddle student organizations. Admission is $5. For advance tickets send a check or money order along with an SASE to ERAU C/O Student Activities, 600 S. Clyde Morris Blvd., Daytona Beach FL 32114, before Sep. 10th. Handicap parking is provided. 6-ft. tables with power are $7 for one, $6 for each additional. 5-ft. tables are $6 for one table, $5 for each additional. All tables have power connections. Tailgate sites in the paved parking lot are $3, no power. VE exams for all classes. There will be a hidden transmitter hunt (with a $50 cash prize) at 4 p.m. You must have a paid admission ticket and sign up for the hunt before 4 p.m. to be eligible for the prize. Contact *DBARA-Hamfest, P.O. Box 9852, Daytona Beach FL 32120; or e-mail [munseyj@mindspring.com].* Web pages are at *[http://www.america.com/~dbara/]* and *[http://www.db.erau.edu/campus/student/club/erara].*

HORSEHEADS, NY The Amateur Radio Assn. of the Southern Tier will present its 24th Annual Elmira International Hamfest-Computer fest on Sat., Sep. 25th, at the Chemung County Fairgrounds in Horseheads. Talk-in will be on 147.360, with an alternate frequency of 146.700 (in case the primary frequency is down). There will be dealer displays of new equipment, and a large flea market area. Breakfast and lunch will be served on the premises. Admission is $4 for advance tickets, $5 at the gate. The event will run 6 a.m.–3 p.m., with VE exams starting at 9 a.m. For VE exam info, contact *John at (607) 565-4020.* Dealers, please call *Gary at (607) 739-0134.* For tickets, call *Dave at (607) 589-7495.*

SEP 26

YONKERS, NY The Metro 70 CM Network will host a Giant Electronic Flea Market Sep. 26th at Lincoln High School, Kneeland Ave., Yonkers NY, 9 a.m.–3 p.m., rain or shine. Free parking. No tailgating. Indoor flea market only. Donation $6, kids under 12 free. Vendors, for advance table reservations, the 1st table is $19, $15 each additional table. All tables 30 inches x 5 ft., or bring your own tables at $14 for a 6-ft.-long space. Tables are $25 each at the door, or $20 for a 6-ft. space. Full payment is due with registration. Table setups are at 7 a.m. For registration, call *Otto Supliski WB2SLQ, (914) 969-1053.* Talk-in on 440.425 MHz PL 156.7; 223.760 MHz PL 67.0; 146.910 MHz; and 443.350 MHz PL 156.7. Mail paid reservations to *Metro 70 CM Network, 53 Hayward St., Yonkers NY 10704.*

SPECIAL EVENTS, ETC.

AUG 20–22

YORK COUNTY, PA On the days of Aug. 20, 21, and 22, the York County ARC and its members will maintain an active presence on the amateur radio frequencies of 7.250, 14.250, 21.250, and 28.500 MHz, to allow as many amateur radio contacts throughout the world as possible. To apply for a Special Event Award, please send a photocopy of your logs or QSLs with 3 IRC (or $3 US) to the award manager: *KC3TL, Pete deVolpi, 408 Hillside Ave., New Cumberland PA 17070-3036 USA.* The award certificate bears the official seal of the York County 250th Anniversary, and is signed by the four commissioners of York County. A printing of only 2500 of these limited edition awards will prove to make this certificate a very valuable award for collectors.

AUG 21–23

SONOMA, CA The Amateur Radio Clubs of Sonoma County CA, co-ordinated by the Empire ARS, K6EAR, will operate a Special Event station 2400 UTC-0000 UTC at the Pacific Coast Air Museum's annual Open House and Air Show at the Sonoma County Airport. Participating clubs are the Sonoma County Radio Amateurs, the Redwood Empire DX Assn., the Valley of the Moon ARC, and EARS. Operating frequencies will be 7.044, 7.244, 14.044, 14.244, 21.044 and 21.344. For QSL, send QSL and a #10 SASE to *EARS, P.O. Box 4151, Santa Rosa CA 95402 USA.*

AUG 28–SEP 2

HAGERSTOWN, MD The Antietam Radio Assn. will operate W3CWC 1600Z–0200Z Aug. 28th–Sep. 2nd to commemorate the 130th anniversary of the birthday of Hiram Percy Maxim, an ARRL cofounder and noted inventer. Operation will be on or near 3.905, 7.23, 7.035, 14.250, 28.450, and 147.09 MHz. A colorful certificate will be available after the QSO for a QSL and large SASE. Mail to the *Antietam Radio Assn., P.O. Box 52, Hagerstown MD 21741-0052 USA.* Please mail requests for the certificate by Sep. 30, 1999. Thank you.

SEP 11–12

MARIETTA, OH W8HH, the Marietta Amateur Radio Club station, will be celebrating the annual Ohio River Sternwheel Festival with a Special Event station on Sat. and Sun., Sep. 11th and 12th. Hours of operation are as follows: Sat.—1300–2300 UTC; Sun.—1300–1900 UTC. CW will be .055 kHz up on 160, 75/80, 40, 20, 15, and 10 meters. On SSB, on General subbands up. A certificate will be issued for confirmed

QRX

continued from page 6

the first type of ham or even the third type—or he may just get out of amateur radio in disgust. (Then we all lose.) This type of ham just needs a helping hand, someone who's willing to help him set up a station or even upgrade! They tend to find only the disgruntled hams, and end up leaving the hobby. Funny how most of us never seem to notice this type of ham as they slowly fade away ...

3. The Very Rare Ham.

This is the ham who wants to help out, and does, in every way that he or she can. This can be in the form of joining the ARES, becoming a VE, starting a ham radio class, setting up a club station, helping out in the community, or helping that second type of ham. Keep in mind that this type is very rare and If you find one, don't lose touch. Too bad that this type of ham seems to be a dying breed. They might not be, if a few more "type two" hams were helped out by, say, the "type one" hams. Type three hams care about amateur radio and its future.

Which type are you? Food for thought!!

Reprinted from the The "Modulator" *(Ft. Myers FL), October 1998; excerpts by Clinton Herbert AB7RG.*

Electrifying Health News

Six years of research have produced little hard evidence that the magnetic fields around electric power lines cause cancer, yet some lingering concems remain. This is the gist of a National Institutes of Health report released on Tuesday, June 15th.

The report says that there have been some small statistical associations between magnetic fields and childhood leukemia as well as chronic lymphocytic leukemia in adults exposed to the fields through their work. But, says the report, there is little confirmable documentation to make any valid connection between the two.

The report indicates that research is continuing in the area of these lingering concems. Also that until we know a lot more, efforts to reduce human exposure to all electromagnetic fields should continue. [Italics added.]

Meanwhile, the Consumer Product Safety Council says that thirty-two percent fewer people accidentally were electrocuted in 1995 than in 1985. The actual number of electrocutions declined from 340 in 1985 to 230 in 1995. Ten percent of the electrocutions in 1995 were attributed to mistakes in installing or servicing rooftop antennas.

Thanks to the NIH and CPSC, via Newsline, Bill Pasternak WA6ITF, editor.

Brazilian Year 2000 Moonbounce Conference

The Araucaria DX Group is working on early preparations to stage an international amateur radio event to be held next year in Brazil!

This event will be identified as the "EME 2000 Brazil Conference." It is bi-annual and was last staged in Paris in 1998 (prior to that, in Washington DC in 1996).

The forthcoming conference will be the ninth, and will be dedicated to 432 MHz and upward Earth Moon Earth (EME) amateur radio activities, covering all technical aspects of this facet of the hobby.

We have received offers to present 26 technical papers at this conference. Rio de Janeiro has been selected as the conference location, and the event will take place on August 18th and 19th, 2000.

A Web page covering this event is available on the Internet at [www.eme2000.com.br]. Please send E-mail to [eme@inepar.com.br].

From an announcement sent by D.W. Murden PY5ZBU.

The Evolution of Amateur Radio Clubs

Radio clubs have existed for over 75 years, but it was not until the conclusion of World War II that ham radio clubs, associations, and societies peaked in popularity. Most pre-war clubs were experimenter groups interested in the new, emerging technology of electronics and communication science. Locally, the Jacksonville Radio Club was active in the 1930s. Though hams belonged, amateur radio was not the only focus.

After the FCC lifted the wartime ban on amateur radio operation in 1945, an evolution from a mostly technical, science-oriented club model to a multipurpose group accelerated. The focus narrowed, with amateur radio becoming the main

2-way contact. Send QSL and 9" x 12" SASE to *W8HH, P.O. Box 393, Marietta OH 45750 USA.*

PLATTSBURGH, NY The Champlain Valley ARC will operate their Station W2UXC, 1400Z–1900Z, Sep. 11th–12th on 7.265 or 14.265 MHz, to commemorate the Battle of Plattsburgh, the final invasion before the end of the War of 1812. For a certificate, send an SASE to *CVARC, P.O. Box 313, Morrisonville NY 12962 USA.*

SEP 25–26

HAMPTON, VA The VASC Amateur Radio Group, Inc., will operate KE4ZXW Sat., Sep. 25th and Sun., Sep. 26th, 0–2400Z on UO-22 or KO-25; 1500–2200Z at :00 on 7.265; at :15 on 14.265 and at :30 on 28.365. The occasion is to celebrate 4 full years of 9600-baud automatic satellite station operation, and amateur radio exhibit. To apply for an Anniversary QSL, SASE to *Ed Brummer W4RTZ, 108 Oyster Cove Rd., Yorktown VA 23692 USA.*

NEVER SAY DIE

continued from page 4

that's progress, eh? The problem is that some software companies don't know they have problems, and others aren't telling. You may have some nasty surprises on January 1, when your computer freezes as solid as the ice outside.

The Sky Is Falling!

It's difficult not to get swept up in the Y2K hysteria. Well, here's an example from my E-mail. Chew on this ...

"There's a good article in the January *Scientific American* on Y2K, with this title and subtitle: 'Fixing Y2K seems simple: change all two-digit years to four digits. But that tedious and unexpectedly difficult process will take more time than is left.' The article concludes: 'I believe that severe disruptions will occur and they will last perhaps a month. Additional problems, ranging from annoyances to more serious issues, will continue to crop up throughout 2000.'"

Just a month without a major resource like water or electricity in the middle of winter could drastically thin out populations. *Scientific American* hasn't done anywhere near as much research on this issue as I have. They are incorrect. The disruptions are going to last much, much, much, much longer than just a month. That sort of optimism isn't backed by any objective facts. When the grid collapses, we aren't going to see it come back up. I agree with Gary North's bleak assessment.

The Canadian government is telling the truth to their citizens, while ours is predictably lying to us about what is coming. They know damn well what is coming: (Clinton has recently signed executive orders 10997-11095, 12919, 12938 solely for the purpose of putting us under martial law. They can be viewed at: [http://www.disastercenter.com/law].

View them, then check this out: A newspaper article titled "Marines Seize Downtown" appeared in the July 24, 1998, Jacksonville Florida *Metro*. 100 U.S. Marines took part in a training exercise called "Urban Warrior" to practice seizing control of key parts of the city. A

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criterion for club affiliation. Recruitment of newcomers, training classes for the new Novice class license, public relations, more operating events, emergency communications assistance, and exchange of technical information became major objectives of many clubs.

Until the late 1960s, hams in an area were usually unified under a single club banner. The ham population then was about a third of what it is today. A large club had 75 members.

Around 1970, VHF FM and repeaters soared in popularity. Commercial technology of the '60s became available cheaply to hams as surplus. Early repeaters usually required combined efforts of hams in an area to finance, install, and maintain. Traditional, general interest groups became fragmented and were often indifferent to interests of those who were amazed by repeaters, autopatches, and the novelty of reliable local mobile-to-mobile communications capability. A ham with an HT in public in 1973 brought looks of amazement from non-hams who gasped as an autopatch was conducted. Today, such capability is routine, but in the '70s, it was a big breakthrough.

Special interest clubs with a narrow focus characterized the 1970s. VHF FM/repeater groups were the most popular, followed by DX/contest groups, and later came digital clubs. General interest clubs continued to decline in the 1980s, although not drastically.

Historically, hams have not been attracted to clubs in major percentages. In a midsize city of 1,000 hams, typically about 350 to 400 will be active at any one time. Many operators run "hot and cold" over the years, drifting between active participation and inactivity. Hams are not known as joiners.

About 250 of the 1,000 hams will belong to the ARRL. 180 or so will join a local club, and about 60 of those will regularly attend club functions and meetings. And a core group of about 50 (5% of the total) will serve as officers or project chairpersons. It is this core group which is key to the future of amateur radio clubs.

Increasingly, members of the 1990s tend to have a "been there, done that" outlook when it comes to volunteering for club duties. Many will perform a function one or two times and then move on. Ham radio and clubs rate a low priority. Many members come to view themselves more as "subscribers" than as members. They expect to receive club services such as repeater access and autopatch use but are not motivated to exert much effort aside from paying annual dues. A repeater group officer once remarked that the best way to ensure a big meeting turnout was to have the repeater "crash" a few days before the meeting and stay off the air. Members who have not been to a function in years will turn out, demanding to know the cause of the interruption of their "service" and upon whom to fix the blame. While somewhat overstated, there is some truth to this.

Most clubs (amateur radio and otherwise) are possible due to efforts of that 5% core. These operators repeatedly take part in club activities and lead projects. Some remain active for decades. The future of clubs rests on keeping this core at critical mass. Without a sufficient core, a club will not function. An interesting facet is that although our club's membership has varied from 60 to almost 500 over the years, the size and quality of the core has been largely independent of the membership size during any year. A club of 60 members might have 15 core members while a club of 500 might have 20 or 30!

Large clubs are preferable because, when regulatory problems arise, officials tend to listen to large groups of people rather than individuals. Postage breaks for mailing newsletters are available whenever 200 or more are sent at the same time.

Clubs that survive will be those who identify those activities which can attract the interest of core members, who then promote the activity to the membership. Members vote for or against an activity by their participation or non-participation. Clubs usually have limited resources in funds and volunteers, and these should be focused on a limited number of well-chosen activities.

Activities should be oriented toward the entry-level ham, although more advanced alternatives can be included if volunteer resources permit. Meetings should not be too technical—an EE degree shouldn't be necessary to understand the speakers.

A trend is toward fewer in-person meetings. Some special interest clubs have cut back to quarterly meetings. Some general interest clubs meet every other month.

Club newsletters may become endangered. Nationally, many clubs have dropped them. The newsletter of the future may be delivered electronically. Club functions and activities change as years pass.

By Billy Williams N4UF, seen in the February 1997 issue of the Balanced Modulator, *published by the North Florida Amateur Radio Society.*

similar exercise took place last May in Chicago with 80 U.S. Marines. As part of the Navy, the Marines aren't constrained by the *posse comitatus* restrictions that prohibit the army from domestic law enforcement. (Of course when martial law is declared, *posse comitatus* will be suspended by executive orders.)

Canadian Government Is Telling the Truth

The Canadian government has been far more up front about the fact that martial law is coming. In an editorial in the Canadian newspaper *The National Post* on December 28, 1998, it states that the RCMP (Royal Canadian Mounted Police) are recommending that prudent Canadians keep at least two weeks worth of food and cash and a month's worth of water stored for January of 2000. The Canadian armed forces have been preparing for the largest mobilization since the Second World War. Operation Abacus will deploy up to 32,000 troops to quell insurrections and rescue the unfortunate when the next millennium begins. The Canadian federal Year 2000 contingency planning group is recommending the sweeping powers of the Emergencies Act (the replacement of the old War Measures Act) be at the ready if and when chaos strikes. The U.S. government will never be this honest, and the Canadian government is not being forthright enough.

People worldwide are going to need *far* more than just the 2 weeks' worth of food and the one month's supply of water that the Canadian government is recommending.

With a daily feeding on that kind of stuff, it's easy to start contemplating on what a house of cards our civilization really is. When the whole western U.S. managed to recently lose power for several hours because one small power station went down, are the suggestions by some experts that come January One the grid could go down and stay down all that ridiculous? If it does, what might happen as a result? Almost everything we have depends on power. No power, no planes or trains. No trains, no gasoline. No power, no businesses or stores open. No gasoline, no trucks delivering food. No roads plowed. No water supply. No telephones. No radio or TV. No banks. No toilets. No stock market. No newspapers. The results of all that are so awful that we don't even want to think about it. Forget it. That's just the rantings of some hysterics. It'll never happen. It *can't* happen! Y2K is just going to be a minor annoyance, right?

Hmm, let's see now, how much would a solar power system cost that would at least run my ham station if the power went down? My emergency diesel generator would eventually run out of fuel, so I'd want solar or wind power to keep my ham rig going.

Hey, I've got to stop that kind of thinking. That's just crazy.

Hmm, maybe I should put up a new tower so I'll have a better signal. You know, just in case.

Nah. Stop worrying, be happy. Everything is going to be just fine.

Sanguinity

I'll tell you why I'm semi-obsessed with the Y2K mess. Yes, I saw the issue of *Time* with the cover feature ridiculing the Y2K worrywarts. But I've also noticed that the people who seem to have the best grasp of the situation are far less sanguine. An item in *Newsweek* the same week said that the Social Security computers will keep the checks going to the aged, but that there are some serious problems with the Medicare and Medicaid systems.

When the MITS Altair 8800, the first microcomputer, was announced in January 1975, I did two things. I recognized the potential impact of this development, so I got one and sat down to learn exactly how it worked. It was this adventure that sparked the idea for *Byte* magazine. The first year's issues were done by me and the *73* staff.

It's my understanding of how computers work that worries me the most about Y2K. They are no mystery to me. If you've used one much you know how easily even a slight bug or virus can blow your data to smithereens. And Y2K is one hell of a bug!

I look at how dependent our whole civilization has become on computers. They're running our airlines, trains, power companies, telephone systems, banking, satellites, communications systems, every aspect of the media, our VCRs, microwaves, our washing machines, and so on. If you stop and think about it, we have one heck of a house of cards, with all of these systems interrelated, so if one goes down, blooey, they all collapse.

If the railroad computers stop the railroads, the coal stops going to power stations and the power grid shuts down. We've seen how delicately that system is set up, with whole parts of the country losing power when one small system breaks down. No power: no railroads, no banks, no TV stations, no newspapers, no grocery stores, no gas pumps, no telephones, and so on. If any part of the whole system fails, that'll crash everything else. Then the question is, how long may it take to get everything going again? And where do they start—without communications.

I hope that Y2K will be the "bump in the road" the Pollyannas are predicting. I also hope that it isn't going to be the catastrophe that the people who have done the most serious investigating are predicting.

Having run some software companies, it's been my experience that as a general rule it takes about seven times as long as programmers predict to get their software working right. In this case, they have to go over hundreds of millions of lines of code, often in some prehistoric language, and correct the date-sensitive problems. Then they have to test drive the repaired code, looking for errors they missed, and correcting new errors they've introduced. This is not trivial, to use the programmer's term.

So here we have tens of thousands of interrelated systems, any one of which could trigger the domino effect. Maybe millions. I hope the speed bump in the road doesn't turn out to be Mt. Everest.

Bamboozled

The government is now taking over half of your pay for its programs. And, when you look closely at most of them, your money is being wasted. You could more than double your pay if you'd stop the bandits you've elected and then reelected from going hog wild with your money.

The federal government now takes 23% of the gross domestic product, up from 18% in 1960 and only 4% in 1930! The huge government we've let build up would be totally unrecognizable to our founding fathers, who gave Congress very limited spending authority. And most of it's spending on social projects. Entitlements. These are programs where Paul is entitled to Peter's money. Robbing Peter to pay Paul.

Social Security has ballooned from $25 billion to $336 billion, with no ceiling in sight. Health care has gone from $2 billion to $272 billion. Welfare from $30 billion to $225 billion, and the poverty rates are no lower now than before the War on Poverty started. Yet national defense spending has only about doubled in the last 50 years!

We have met the enemy and the enemy is us. We are the ones who elect these spenders, and then we keep reelecting them until they head a spending committee. And we still reelect them, no matter how much it is costing us out of our pockets.

As in so many things that we have been led to believe in, we've been bamboozled. Hoodwinked. Scammed. Defrauded. Screwed.

As I mentioned when I reviewed *A Nation of Millionaires*,

if our Social Security withholdings were invested as they are doing in Chile and a growing number of other countries, and if we could have health care savings accounts, then we'd all be able to retire as multi-millionaires.

Wasting Money

One of the larger hamfests that has stopped inviting me to speak sent me a form letter suggesting that I donate prizes and advertise in their program. Hey, sorry, guys.

I may be a difficult learner, but if you hit me on the head long enough it finally gets my attention. For many years I was happy to send a bunch of prize subscriptions to hamfests. But after having enough hams come by my booth and not subscribe because they were hoping to win one of the prize subs, I finally stopped shooting myself in the foot. How many ham rigs would providing one as a prize stop being sold at a hamfest? Then there's the idea that, gee, someone is going to get the equipment for free, so why should I shell out $600 for something that could be free? A prize tends to cheapen the product in a prospective customer's eyes.

Well, how about program booklet ads? For years I ran every kind of ad I could think of in hamfest program books. I don't think I ever got one single subscription as a result. Not one! Oh, the hams grab a program when they get to the hamfest, and a few of them actually look to see what talks are going to be where and when. There's no evidence that a program book has ever been looked at after that. It goes up on a shelf in the shack and lies there untouched until the ham dies and his wife can finally throw it and all those ham magazines out. There is no record of a ham ever throwing *anything* ham-related out. Unless the ham specifies in his will that his QSL collection is to be buried with him, as is usually the case, the XYL will throw that clutter out, too.

Ham industry people, unless you are solidly convinced that any prize you donate is going to somehow result in your selling ten times the cost of your equipment in added sales, don't be a sucker.

Leaders and Followers

When I see teenagers smoking, I know two things. One, they're stupid. Two, they're more worried about what others think of them than what they think of themselves. I know they are followers (a.k.a. sheep).

When I see teenagers wearing baseball caps on backwards I know they are followers.

When I see them wearing sloppy, baggy clothes I know they are unable to think for themselves and will never be leaders or entrepreneurs.

When I see kids with their sneaker laces trailing I know they are followers.

When I see teenagers drinking beer, I know they are followers and incapable of original thoughts.

When I was in college a group of my fraternity brothers would bring in a keg of beer on weekends and get stinking. I've watched the alumni reports and none of 'em have ever achieved anything of significance. While they were boozing it up in the living room, I was in my ham shack making contacts with hams around the world and building ham and hi-fi equipment.

Many of 'em smoked. I think they're almost all dead now.

Oh, I tried smoking and beer, but my body warned me against that crap and, not being driven by peer pressure, I paid attention. Ditto coffee, too, oddly enough.

No Takers

A note from Keith KA8LDS mentioned that at the December election of officers meeting of the Dixie Amateur Radio Club (Utah), no one would take the job of president. A new ham, who had just moved into the area, turned up at the January meeting and was quickly elected.

Well, being the president of any club is a responsibility, and most people seem to spend their lives avoiding responsibility. These people are what are known as "followers." Either through heredity or extended exposure to our public school system, they are unable to think for themselves, so they do what they're told and avoid confrontation. It would never occur to them to start their own business or to accept the responsibility of being the president of a club.

Yes, being the president of a club is work, but it's fun, too. You're in show business. Meetings are either fun for the members or they'll stop coming. Just getting hams together for a meeting doesn't cut it. You need a program. Preferably a controversial program.

For instance, if you've a ham store in your area, get the owner to come in and tell some stories about the really crazy customers he's had to deal with. Chuck Martin WA1KPS, who used to run Tufts Radio, used to tell me about some of his experiences and I wish I'd taped them! Unbelievable. Anyone who tries to tell you that even some hams are sane needs a wedgie.

Does anyone in your area have a new rig he can bring for a show and tell? How about some really odd person who has let his reason depart him and is making some kind of equipment to sell to hams? I know I'd drive a long way to hear someone who's been flying the new Kachina system.

Or how about getting your director to come in and explain why the League has done virtually nothing to get newcomers interested in amateur radio? And why they are still pushing so hard to keep newcomers out with their code requirements? And to discourage Techs from upgrading?

Is anyone in your area making satellite contacts? Slow scan? Heck, is anyone doing anything but talking about nothing on the air?

Scott Joplin

The more I'm reading about Martin Luther King, the more I'm disturbed that he's been selected as a representative of the black race for a day in his honor. There are many blacks who have contributed more to our country, and who don't have as much bad baggage.

My first choice would be Scott Joplin, who, as far as I'm concerned, was the greatest American composer of *any* race or any time. My second choice for the greatest American musical genius would be Louis Moreau Gottschalk, followed by George Gershwin, Cole Porter, Lenny Bernstein, et al. We've had a few giants, but Joplin's genius completely outshines them.

Joplin has left us with a fantastic legacy of indescribably beautiful music. If all you're familiar with are "The Entertainer" and "Maple Leaf Rag," you have one heck of an experience in store.

I first became acquainted with Joplin when I saw *The Sting*. I said, wow, how have I managed to miss such great music? I bought every LP I could find and played them night and day. But the more I played them, the more I sensed that the performers were missing Joplin's real spirit.

Through the usual serendipity, chance had me find Scott Kirby, who was playing Joplin the way I was hearing his music in my head. I built a studio and we recorded almost everything of Joplin's. If you'd like to hear a sample, send $10 for a cassette (Volume 3) with 12 of Joplin's rags and songs, including the Maple Leaf Rag, and Solace, the Mexican serenade. $15 for the CD. You'll see what I mean and be addicted. The next thing you know, you'll be looking for ragtime festivals with Scott Kirby performing.

I'd prefer to see a holiday celebrating a black performer who started playing the piano in a whorehouse in Sedalia, Missouri, and ended up having an opera performed on Broadway. His genius has thrilled music lovers for a hundred years and, if we don't get wiped out, will thrill people for at least another hundred.

Music Biz

When compact discs were

first introduced in 1983, the music and audio magazines ridiculed them unmercifully. We would always have LPs, they agreed. Besides, they said LPs sounded better than CDs.

I felt that CDs sounded better—no needle scratch, no turntable rumble, no bass and treble limitations, nowhere near the limitations on dynamic range, and so on. But I knew that the public would need a guide to tell them which were the good CDs and which were the bummers, rating audio quality, performance, and the quality of the music itself. So I started *CD Review* magazine in 1984. When CDs became the fastest growing new consumer electronic industry in history, my magazine became the country's leading music magazine.

After seven exciting years I felt that the era of high growth would be ending. By then everyone had replaced their LPs with CDs, plus there had been nothing new in music in years with which to spark sales. Not one classical music piece had been written in almost 40 years worth listening to twice. Popular music had disintegrated into garbage. Not even country music had survived the blahs. So I sold my magazine to megapublisher IDG. It has since disappeared, but not before deserving to disappear.

One of the things that might have helped the music industry survive was a lowering of CD prices. In the early days it cost around $3.50 per CD to make them, so a $15 retail price made sense. But with automation and competition, the cost of making a CD got down to around 65¢. No wonder so many companies are able to give them away! But the record companies kept their prices high, killing the public's demand for new music, and helping to put the record store chains out of business one after the other.

Now comes MP3 and cries from the record companies that the Internet is going to put them out of business. Since this gang of six megacorporations (five are foreign-owned) are, in my opinion, thoroughly corrupt, it couldn't be a better comeuppance. One of the best things that could happen to music would be for the major labels to go out of business. They are the problem, not the solution.

Before the CD we had both LPs and 45s, with the 45s for single songs. CDs, with their one hour recording time and cost, killed the issuance of single songs. It's all "albums" now, and it's seldom that there are two singles on an album that get played more than once.

Along comes MP3, a compression system which provides CD-quality sound for a three-minute song on 3 MB of disk space.

As an aside, in case you wonder why songs generally run three minutes, it's a hangover from the old 78 rpm record days, when a 10" record held 3.5 minutes of music on each side. The 12" discs held 5 minutes per side.

It's easy to download the MP3 software, and then all you have to do is find any of the endless sites making the music available. How popular is all this? A recent study showed that high school students have virtually stopped buying CDs. The record industry is all upset, but there isn't much they can do about it. Gee, isn't that tough!

The public will best be served if there is a way for what few creative people we have in music to get their creations to the public.

As I've mentioned before, a report in *Forbes* showed that 98% of the performers on the major labels never made a nickel of royalties. The record companies use the same creative bookkeeping as the movie giants. When I recorded the Marty Balin group (Jefferson Airplane, Jefferson Starship) in my digital recording studio and put them out on my *Green With Envy* label, they made far more royalties with me than they ever did with the major labels. I've still got a few of their CDs and cassettes, so if you'd like one send me an extra $5 the next time you order some of my books.

If MP3 topples the major labels, there are thousands of small labels waiting for their turn to get your business. I found that it was these independents (the "indies") which had the *only* creative new music. To help them reach the public despite the major labels spending over $100 million a year to prevent radio stations playing indie music, I produced and distributed millions of indie music samplers, helping to boost their sales from 4% of the market to almost 16%! Alas, when I sold my magazine, that was the end of the indie samplers. The new owner didn't want to upset the major labels.

I wish I had the time to set up an MP3 site where I could make the tens of thousands of indie songs I've got stored here available. Some of them are really exciting.

Serendipity

Sherry has been after me to let you know about the *Better Generation* CD and cassette I made for Marty Balin—recorded in my studio. Remember the Jefferson Airplane and Jefferson Starship? Well, that was Marty Balin and his group. Marty needed a CD of his new songs to sell on his group's next tour and he'd been so badly screwed by the major labels that he came to me. Marty claims he's made more royalties from this release than from anything his group had done in the past.

Anyway, just as I was getting Marty's CD and cassette ready to promote, a letter came in from Ian Zukswert of Broadalbin, NY. "I'm writing to let you know how much I enjoyed the CD *Better Generation* by Marty Balin. I happened on it at a record store in Albany. It's great to hear some super music by the extremely talented Marty Balin once again. He's a legend with one heck of a career and I appreciate your making it possible to hear some of his current tunes."

If you're into the "Jefferson" sound you'll enjoy Marty's latest release. If you're interested I'll make the CD or the cassette of *Better Generation* available for you for $5. While they last. Add it to your Radio Bookshop order.

Trust

After having enjoyed the seemingly endless exposés of government corruption on CBS' *60 Minutes*, I was disappointed in the recent *60 Minutes 2* spinoff. Mostly potatoes and little meat. But then *20/20* , ABC's imitation of *60 Minutes*, started off with a fairly meaty program of exposés interlaced with sob-sister filler and gradually lost its way. NBC's *Dateline* never did get the hang of digging for dirt. *48 Hours* too started off exposing corruption, but gradually eroded into human interest pieces—a.k.a. sob-sister fluff.

How much of this downslide of these so-called magazine format shows is the result of low budgets, and how much a reflection of the harsh realities that the exposés show? While they are interesting to watch, seldom do they result in any changes being made, plus they stir up the anger of major corporations and their government connections, which are the root of much of the corruption.

Has the concept gotten through to you yet that the bigger our government is, the more corrupt it is? Money is the key. As they say, just follow the money. Well, it's not that difficult to follow it from major corporations through their lobbyists into the pockets of politicians, who need the money to get reelected—and other incidentals—you know, like mistresses and nice homes. Has the parade of upper echelon Clinton Administration people being dismissed in disgrace gotten your attention?

Sure, some legislators get elected and go to Washington with the intention of doing good. And they do very well indeed. It doesn't take long before the message gets through—you either go along with the system or you will get nowhere.

You're probably aware of

all this, but feel helpless to do anything. My approach is to spread little cancers into the system and hope they'll grow. Cancers? Yep, with my Never Reelect Anyone battle cry. Look, if enough people will sign up to NRA, lobbyist money will dry up because reelection campaigns won't work any more. You want to run for Congress? No problem, but it's one term and you're out. No cushy committee assignments. The whole pork system would blow away and Congress would be able to actually work for the betterment of the country instead of themselves. Yes, it's a novel concept, and probably will never fly.

Sale!

A while back I put together a 64-page book of my as-of-then-unpublished editorials. Well, I tend to get several months ahead, so I thought they could be helpful to ham club newsletter editors to reprint, providing them with some interesting filler material. The book has 60 of my editorials, covering the usual wide variety of subjects. It sold for $5 and sold well. But since then the editorials have appeared in *73*, so I can't advertise them as editorial previews. I have a few copies left, if you're interested. $2 while they last. If I run out I'll give you a $3 credit toward your next purchase.

If you've an interest in cold fusion, I've got one whale of a bargain for you. How about the most recent seven issues of *Elemental Energy (Cold Fusion)*, a $70 value, for $25? I want to get more people interested in experimenting and, hopefully, in investing in the field. These issues are packed with reprints of cold fusion patents, and a series of theory papers by the world's leading scientist in the field, Professor Hideo Kozima. The whole set runs 484 pages, so it'll keep you busy for quite a while. This includes a reprint of the NASA lab report confirming the cold fusion excess heat reality. For $5 extra, I'll throw in a copy of the premiere issue of *Cold Fusion*, the one that won the *Folio* prize as the best new technical publication. It's also packed with good information. Order the $25 CF-1 package for the seven most recent issues (#22-28), or the $30 CF-2 package for the #1 and #22-28 collection. While they last, naturally, and the supply really is limited.

Taxes

Here's an interesting project for someone to research. Maybe a college student. I'd like to know (and so would a lot of other people) what percentage of our paychecks go for taxes. That would include state and federal income taxes, mandated employer insurance such as medical and unemployment. Medicare, sales taxes on the remaining money we typically spend, plus gas, telephone, cigarette, movie, and other taxes. A percentage of the cost of everything we buy is taxes, including excise taxes on imports, state transfer taxes, property taxes, inheritance taxes, playing card taxes, car registration, mandatory car insurance, and so on. Then there are the taxes on the salaries of the people who make the products you buy. There are gas, road, and license taxes on the trucks moving our food.

If we take someone, for example, who is making $2,000 a month before any taxes, what percentage of their $24,000 gross would be net after all taxes? I suspect that the recent 50% estimate may be low. Say, do you mind working half of your time just to support the government? Early in our century it used to take about 2% of people's wages to run the government.

The Fed

Though you probably already know that the Federal Reserve Bank isn't government owned, but is a group of private banks, I'll bet a bunch that you don't know how these banks got their franchise to issue all of the money for the country.

It all happened between 1:30 and 4:30 a.m. on December 22, 1913, when the Democratic members of the Conference Committee, without letting the Republicans know about the meeting, rushed the Federal Reserve Act through the House and Senate. The next day, President Wilson signed the act into law.

The act transferred the money supply of the United States from Congress to a private banking elite, giving them a monopoly. The Federal Reserve is controlled via 53% of the stock by the Federal Reserve Bank of New York and the Chase Manhattan Bank.

The chairman of the House Banking and Currency Committee, Louis McFadden, said, "We have in this country one of the most corrupt institutions the world has ever known. I refer to the Federal Reserve Board."

Well, gee, if the Fed is so terrible, how come we haven't been seeing media exposés in the papers and on TV?

Guess who the majority stockholders of the TV networks and major newspapers and magazines are. The banks, of course. The same banks that control the Fed. Less than 25% of our daily papers are independently owned.

Well, if you were controlling a major bank with an exclusive government license to make money, you'd cover your ass by using some of that clout to make sure no one would upset the apple cart.

John Swinton, the former chief of staff of the *New York Times*, made this statement at the New York Press Club: "There is no such thing as an independent press in America, if we except that of little country towns. You know this and I know it. Not a man among you dares to utter his honest opinion. Were you to utter it, you know beforehand that it would never appear in print. Were I to permit that a single edition of my newspaper contained an honest opinion, my occupation, like Othello's, would be gone in less than 24 hours. It is the duty of a New York journalist to lie, to distort, to revile, to toady at the feet of Mammon, and to sell his country and his race for his daily bread. We are the tools and the vassals of the rich behind the scenes. We are marionettes. These men pull the strings and we dance. Our time, our talents, our lives, our capacities are all the property of these men. We are intellectual prostitutes."

It's interesting to read about how banks got started as money changers (maybe you remember Jesus getting himself in big trouble messing with these guys). Check out [www.themoneymasters.com].

With a potential cash panic coming up as more and more people get wind of the possibility of a serious cash shortage as a result of Y2K problems, you have to remember that 97% of the money you have in the bank has been loaned out, so once their 3% cash reserve is gone, they have to close their doors.

Actually, banks are permitted to lend out ten times more money than they actually have, and charge interest on it. Maybe you've wondered why bank buildings are always the biggest and fanciest in town.

If I die of a "heart attack" or something, you'll know that I've finally managed to step on toes that are too big.

Congress did this, and Congress *could* undo it, but with the money controlled by the few people who control the big banks and the media, and Congress being controlled by money, there isn't a chance.

Other than this old crackpot in New Hampshire, who else has the stupidity to blow the whistle on how crooked our money, banks, schools, government, and health systems are?

A Fungus Among Us

Dan Carlson, the chap who developed Sonic Bloom, which makes plants (including trees) grow over five times faster and bigger than

Continued on page 62

PROPAGATION

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August 1999						
SUN	MON	TUE	WED	THU	FRI	SAT
1 G-F	2 F	3 F-P	4 P	5 P	6 P-F	7 F
8 F	9 F-G	10 G	11 G-F	12 F	13 F	14 F
15 F	16 F	17 F	18 F-P	19 P	20 P-VP	21 VP-P
22 P-F	23 F	24 F-G	25 G	26 G	27 G	28 G-F
29 F	30 F	31 F-G				

August

There will be a full solar eclipse on August 11th in the northeastern USA, northern Canada, the North Atlantic Ocean, Europe (including the British Isles), North Africa, Asia (except the eastern part), and the northern Indian Ocean. The eclipse will be partial elsewhere. Totality will occur at approximately local noon.

As usual, the HF bands in August will be recovering from dull summertime conditions, but are not expected to become fully active until September. Sunspot cycle 23 continues to be disappointingly sluggish, with only occasional spurts of the Solar Flux Index to the neighborhood of 200. To take advantage of these times, listen to WWV on 10 MHz at 18 minutes after any hour for the report of "Solar–Terrestrial Conditions."

You can see from the August calendar that there are likely to be a few Good (G) days this month: the 10th, and the 25th–27th. The Poorest days (P, VP) are likely to be on the 4th, 5th, and 19th–21st, which are expected to exhibit some solar flare activity and a very active magnetic field with accompanying ionospheric disturbances. There is a distinct possibility of other geophysical upsets such as earthquakes, hurricanes, and tornadoes at these times. However, conditions following recovery from the poorest days are likely to be very good.

September

This month is expected to provide some excellent DX opportunities on the HF bands, although Cycle 23 continues its sluggish and slothful ways and the solar flux index remains below 200 at the time of this report (June).

Your *best* days are expected to be 4–7, 12, 13, and 16–18. The *poorest* days are expected to concentrate at the end of the month between the 25th and the 30th, when you can expect a very disturbed magnetic field, poor signals (if any) on DX paths, high RF absorption and strong geophysical upsets on earth, including the possibility of a major hurricane during the last week. (See calendar.) *Semper paratus.*

Band-by-band forecast

10–12 meters

Expect morning F2 path openings to Europe and Africa; on (G) days, midday path openings to South and Central America, and F2 path openings to Japan, Australasia, and the Pacific during the afternoon at your location. DX moves west as the day progresses.

15–17 meters

Expect good DX paths to most areas of the world, with excellent openings from the northern hemisphere to Africa, South America, and the Pacific during hours of daylight, and peaking during local afternoon. Good short-skip communication over 1000 miles will occur on (G) days.

20 meters

Very good DX openings to all areas of the world from sunrise through the early darkness hours. The signals will peak an hour or two after sunrise at your location, and again during the afternoon. Short skip beyond about 700 miles will occur during daytime hours.

30–40 meters

Good worldwide DX openings from sunset to sunrise should occur on (G) days. Noise levels (static) will be higher if thunderstorms occur, and can depress audibility. Short skip between 100 and 1000 miles will occur during daylight hours, and at distances beyond 1000 miles at night.

80–160 meters

On 80, DX to the southern hemisphere and to Europe should occur after dark and during sunrise hours—limited, of course, by static noise levels. Daytime short skip to about 350

EASTERN UNITED STATES TO:												
GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA							20	20				
ARGENTINA	10/15	20	20	20	20						10/15	10/15
AUSTRALIA	15	15	15/20	15/20	40/80	40/80	20					15
CANAL ZONE	15	20	20	20	40	40	20	20	20		10	15
ENGLAND	20	20	20		40						20	20
HAWAII	15	15	15/20	20	40/80	40/80						15
INDIA	20	20										
JAPAN							20	20				
MEXICO	15	20	20	20	40/80	40/80	20	20	20		10	15
PHILIPPINES	15	15	15/20	15/20	40/80	40/80	20					
PUERTO RICO	15	20	20	20	40	40	20	20	20		10	15
RUSSIA (C.I.S.)	20	20										20
SOUTH AFRICA		40/80	40/80	20	20	20	20				20	20
WEST COAST	40/80	40/80	40/80	40/80	40/80	40/80	40/80		10/20	10/20		
CENTRAL UNITED STATES TO:												
ALASKA							40/20	20				
ARGENTINA	15/20	20/40	20/40								15	15/20
AUSTRALIA	15			20	20/40	20/40	20/40					15
CANAL ZONE	20	20	20	40/80	40/80		20	20	15	15	10	10
ENGLAND	20	20	20/30	40	40		20	20				20
HAWAII	15	15	20	20	20/40	40	40	20	20			15
INDIA			20	20								
JAPAN						40/80	40/80	20	20			
MEXICO	20	20	20	40/80	40/80		20	20	15	15	10	10
PHILIPPINES	15			20	20/40	20/40	20/40					15
PUERTO RICO	20	20	20	40/80	40/80		20	20	15	15	10	10
RUSSIA (C.I.S.)	20	20	20					20				20
SOUTH AFRICA				20/40	20/40	20						
WESTERN UNITED STATES TO:												
ALASKA					20	20	40/80	20	20			
ARGENTINA	15/20	15/20	20	20	40	40						15
AUSTRALIA	15	15	15	20	20		40/80	20/40	20			
CANAL ZONE	10/15	15/20	15/20	20/40	40	40		20	20			10
ENGLAND	20	20										
HAWAII	15	15	15	20	20/40	20/40	40		20	20		
INDIA								20	20			
JAPAN				20	20	40/80	40/80		20	20		
MEXICO	10/15	15/20	15/20	20/40	40	40		20	20			10
PHILIPPINES	15	15	15	20	20		40/80	20/40	20			
PUERTO RICO	10/15	15/20	15/20	20/40	40	40		20	20			10
RUSSIA (C.I.S.)	20	20	20					20	20			20
SOUTH AFRICA				20	20							
EAST COAST	40/80	40/80	40/80	40/80	40/80	40/80	40/80		10/20	10/20		

Table 1. August Band-Time-Country chart.

September 1999						
SUN	MON	TUE	WED	THU	FRI	SAT
			1 F	2 F	3 F-G	4 G
5 G	6 G	7 G	8 G-F	9 F	10 F	11 F-G
12 G	13 G	14 G-F	15 F-G	16 G	17 G	18 G
19 G-F	20 F-P	21 F-P	22 P-F	23 F	24 F-P	25 P
26 P-VP	27 VP	28 VP-P	29 VP-P	30 P		

miles, and beyond 500 miles after dark, will prevail on (G) days. On 160, no daytime propagation will occur due to ionospheric absorption of signals, but after dark, peaking around midnight and again during the predawn hours, you should be able to work many areas of the world. Short skip from 1000–2000 miles or so will prevail during the nighttime hours ... but, as always, it will be limited by high static levels from thunderstorm activity.

Don't forget to work the *darkness path* (±30 minutes around local sunset).

Check the bands above and below the suggested ones for possible DX surprises. It's often a good idea to park your receiver on a seemingly unused frequency and just wait. A DX station is very likely to pop up before any one else hears him, and you can snag a good catch.

Please note that on this month's Band-Time-Country chart, (*) indicates a possible 80 meter opening, and (-) indicates a difficult path. Good hunting! W1XU/7.

EASTERN UNITED STATES TO:												
GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	15/17	20/30	-	-	-	-	20/30	20/30	-	-	-	15/17
ARGENTINA	20/30	20/30	40	40	-	-	-	-	-	10/12	10/12	15/17
AUSTRALIA	15/17	-	20/30	-	-	40	20/30	20/30	-	-	-	15/17
CANAL ZONE	15/17	20/30	40*	40*	40	-	20/30	20/30	20/30	10/12	10/12	15/17
ENGLAND	40	40	40*	40	-	-	20/30	15/17	10/12	10/12	20/30	20/30
HAWAII	15/17	20/30	20/30	40	40	40	20/30	20/30	-	-	10/12	10/12
INDIA	-	-	-	-	-	-	20/30	20/30	-	-	-	-
JAPAN	15/17	20/30	-	-	-	-	20/30	20/30	-	-	-	15/17
MEXICO	15/17	20/30	40*	40*	40	-	20/30	20/30	20/30	10/12	10/12	15/17
PHILIPPINES	-	-	-	-	-	-	20/30	20/30	-	-	-	-
PUERTO RICO	15/17	20/30	40*	40*	40	-	20/30	20/30	20/30	10/12	10/12	15/17
RUSSIA (C.I.S.)	40	40	-	-	-	-	-	15/17	15/17	20/30	-	-
SOUTH AFRICA	20/30	-	-	-	-	-	-	-	15/17	15/17	10/12	20/30
WEST COAST	40	80	-	-	-	-	-	20/30	20/30	20/30	15/17	40
CENTRAL UNITED STATES TO:												
ALASKA	15/17	-	-	-	-	-	-	-	-	-	-	15/17
ARGENTINA	15/17	20/30	20/30	40	40	-	-	-	-	-	10/12	15/17
AUSTRALIA	15/17	20/30	20/30	20/30	-	40	80	-	-	-	-	15/17
CANAL ZONE	15/17	20/30	20/30	40*	40*	-	-	15/17	15/17	10/12	10/12	15/17
ENGLAND	-	40/80	40/80	-	-	15/20	15/17	15/17	20/30	20/30	20/30	-
HAWAII	15/17	20/30	20/30	40	40	40*	80	20/30	-	-	10/12	15/17
INDIA	-	-	-	-	-	-	-	20/30	-	-	-	-
JAPAN	15/17	-	-	-	-	-	-	-	-	-	-	15/17
MEXICO	15/17	20/30	20/30	40*	40*	-	-	15/17	15/17	10/12	10/12	15/17
PHILIPPINES	15/17	20/30	-	-	-	-	-	20/30	-	-	-	-
PUERTO RICO	15/17	20/30	20/30	40*	40*	-	-	15/17	15/17	10/12	10/12	15/17
RUSSIA (C.I.S.)	-	-	-	-	-	-	-	20/30	15/17	20/30	-	-
SOUTH AFRICA	20/30	-	-	-	-	-	-	-	-	15/17	15/17	20/30
WESTERN UNITED STATES TO:												
ALASKA	10/15	15/17	15/17	20/30	20/30	20/30	40	40	-	-	-	15/17
ARGENTINA	10/15	20/30	20/30	40-	-	-	-	-	-	-	15/17	10/15
AUSTRALIA	10/12	15/17	15/17	20/30	20/30	40-	40	40-	20/30	20/30	15/20	15/17
CANAL ZONE	20/30	20/30	40/20	40/20	40	-	-	20/30	15/17	15/17	10/12	10/12
ENGLAND	-	-	-	-	-	-	-	-	-	15/20	15/20	-
HAWAII	10/12	15/17	20/15	40	40*	40*	40	40	-	20/30	20/30	20/30
INDIA	15/20	15/20	-	-	-	-	-	-	20-	-	-	-
JAPAN	10/15	15/17	15/17	20/30	20/30	20/30	40-	40-	-	-	-	15/17
MEXICO	20/30	20/30	40/20	40/20	40	-	-	20/30	15/17	15/17	10/12	10/12
PHILIPPINES	15/20	15/20	-	20/30	-	40-	40-	-	20/30	20/30	-	15/17
PUERTO RICO	20/30	20/30	40/20	40/20	40	-	-	20/30	15/17	15/17	10/12	10/12
RUSSIA (C.I.S.)	-	-	-	-	-	-	-	-	20/30	-	-	-
SOUTH AFRICA	20/30	20/30	-	-	-	-	-	-	-	15/17	15/17	20/15
EAST COAST	40	80	-	-	-	-	-	20/30	20/30	20/30	15/17	40

Table 2. September Band-Time-Country chart.

LETTERS

From the Ham Shack

Anonymous, Madison WI. During the buildup to the great gasoline war of 1990, I was in a KC-135 aerial tanker unit delivering fighters deploying through the Mediterranian Sea to the Middle East. We would pick them up around Gibraltar, refuel them en route, and drop them off around the Red Sea. Then we would turn around and come back.

In that area of the world, I kind of liked our other pals to be up on an HF frequency in case we got separated, but we wanted some privacy, too. All the HF refueling frequencies are monitored by everyone around the world, so they were out. I finally hit upon the idea of camping out on an 11-meter CB frequency (channel 19, to be exact), figuring that even the nosiest spy or satellite on their side *or* our side wouldn't be hardy enough to listen to that frequency for long without going buggy.

It worked. We got HF contact when needed and could babble, alter plans, and screw off to our heart's content, secure in the knowledge that the truckers of America had the frequency jammed tight against those prying rascals on both sides. 10-4!?

Ken Meyer K9KJM, Sturgeon Bay WI. Enclosed is a picture of my ever growing antenna farm.

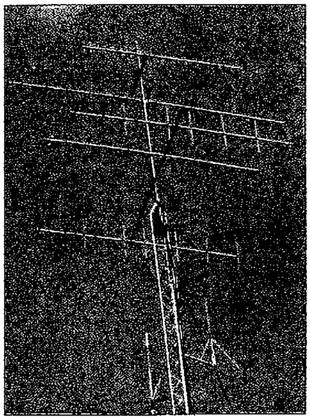
Pictured is the 65-ft. tower next to the radio "shack" with M2 440-18 UHF vertical, M2 2M12 horizontal 2 meter, M2 440-21 horizontal, and a pair of homemade 8-element "Quagi" 2 meter vertical antennas. Side-mounted on the tower is an ICOM AH 7000 and Channel Master scanner antennas.

Under construction at this time is a new 80-ft. tower 150 feet north of the pictured tower, and a 50-ft. tower 150 feet south of it. These towers will be for HF use.

Not pictured is a 40-ft. "windmill" tower 85 feet east of the pictured tower, and a 55-ft. tower 100 feet west of it.

Both are used to hold up HF dipole antennas, 2 meter packet omni antennas, and an HF vertical.

While I do not have the small lot size restrictions, I do have problems with trees. Every new wire antenna means cutting down a few trees, mostly pine, but the trees do not go to waste. The large ones are taken to a sawmill and cut into boards that I can hopefully use to add on to the ham shack.



Number 64 on your Feedback card

Barter 'n' Buy

Turn your old ham and computer gear into cash now. Sure, you can wait for a hamfest to try and dump it, but you know you'll get a far more realistic price if you have it out where 100,000 active ham potential buyers can see it, rather than the few hundred local hams who come by a flea market table. Check your attic, garage, cellar and closet shelves and get cash for your ham and computer gear before it's too old to sell. You know you're not going to use it again, so why leave it for your widow to throw out? That stuff isn't getting any younger!

The *73* Flea Market, Barter 'n' Buy, costs you peanuts (almost)—comes to 35 cents a word for individual (noncommercial!) ads and $1.00 a word for commercial ads. Don't plan on telling a long story. Use abbreviations, cram it in. But be honest. There are plenty of hams who love to fix things, so if it doesn't work, say so.

Make your list, count the words, including your call, address and phone number. Include a check or your credit card number and expiration. If you're placing a commercial ad, include an additional phone number, separate from your ad.

This is a monthly magazine, not a daily newspaper, so figure a couple months before the action starts; then be prepared. If you get too many calls, you priced it low. If you don't get many calls, too high.

So get busy. Blow the dust off, check everything out, make sure it still works right and maybe you can help make a ham newcomer or retired old timer happy with that rig you're not using now. Or you might get busy on your computer and put together a list of small gear/parts to send to those interested?

Send your ads and payment to: *73 Magazine*, Barter 'n' Buy, 70 Hancock Rd., Peterborough NH 03458 and get set for the phone calls. The deadline for the November 1999 classified ad section is September 10, 1999.

NEVER SAY DIE

continued from page 59

normal, is growing several hundred black walnut trees, which are worth about $100,000 apiece at maturity. I'll have to call him and ask if he's thought of also growing black winter truffles under his trees.

Black truffles are extremely fragrant fungi which grow at the roots of oak, nut, and willow trees in Spain, Italy, and the south of France. Truffles can sell for as much as $800 a pound, so they're a great cash crop, and at least one entrepreneur who has a filbert farm is planning on growing 'em here in America.

In Europe, they use pigs to find the truffles, but they have a tendency to eat 'em, if not watched very carefully. Better, is a trained cocker spaniel. There's a chap in New Jersey who's trained his dog to find truffles by using bits of hot dog soaked in truffle juice buried around his yard.

Of course, if you live in a city you won't have a lot of oak, nut, or willow trees around—and you may not survive Y2K anyway, so never mind. But then I keep pushing you to start your own business so you can get the hell out of the city and not waste so much time on commuting.

Imprimis

This is a free publication from Hillsdale College which often has some very interesting reprints of talks given at the college. Drop 'em a request at Hillsdale College, Hillsdale MI 49242.

In their November issue they had a piece about the National Foundation for Teaching Entrepreneurship (NFTE), which has been teaching kids, primarily from poor families, how to start and run their own businesses. The government has blown $1.5 trillion on the lost War on Poverty. Handouts are no answer to poverty, work is. The NFTE has produced 21,000 graduates so far, and a third of them are still running their own businesses! 95% of their graduates want to start their own businesses, as compared with 50% of the public.

Well, I've been preaching entrepreneurialism most of my life. I see it as the best way to achieve freedom, to have the potential for making plenty of money, and to end miseries such as commuting to work and the fear of being downsized, laid off, or having your job moved to Mexico.

Radio Bookshop

Here are some of the books Wayne has written. Some can change your life, if you'll let them. If the idea of being healthy, wealthy and wise is of interest to you, start reading. Yes, you can be all that, but only when you know the secrets which Wayne has spent a lifetime uncovering.

The Secret Guide to Health: Yes, there really is a secret to regaining your health and adding 30 to 60 years of healthy living to your life. The answer is simple, but it means making some very difficult changes. Will you be skiing the slopes of Aspen with me when you're 90 or doddering around a nursing home? Or pushing up daisies? No, I'm not selling any health products. $5 (H)

The Secret Guide to Wealth: Just as with health, you'll find that you have been brainwashed by "the system" into a pattern of life that will keep you from ever making much money and having the freedom to travel and do what you want. I explain how anyone can get a dream job with no college, no résumé, and even without any experience. I explain how you can get someone to happily pay you to learn what you need to know to start your own business. $5 (M)

The Secret Guide to Wisdom: This is a review of around a hundred books that will help you change your life. No, I don't sell these books. They're on a wide range of subjects and will help to make you a very interesting person. Wait'll you see some of the gems you've missed reading. $5 (B)

Cold Fusion Overview: This is both a brief history of cold fusion, which I predict will be one of the largest industries in the world in the 21st century, plus a simple explanation of how and why it works. This new field is going to generate a whole new bunch of billionaires, just as the personal computer industry did. $5 (C)

The Bioelectrifier Handbook: This explains how to build or buy a little electrical gadget that can help clean the blood of any virus, microbe, parasite, fungus or yeast. The process was discovered by scientists at the Albert Einstein College of Medicine, patented, and then hushed up. It's curing AIDS, hepatitis C, and a bunch of other serious illnesses. The circuit can be built for under $20 from the instructions in the book. $10 (A)

Moondoggle: After reading René's book, *NASA Mooned America*, I read everything I could find on our Moon landings. I watched the videos, looked carefully at the photos, read the astronaughts' biographies, and talked with some of my readers who worked for NASA. This book cites 25 good reasons I believe the whole Apollo program had to have been faked. $5 (D)

Mankind's Extinction Predictions: If any one of the experts who have written books predicting a soon-to-come catastrophe which will virtually wipe us all out are right, we're in trouble. In this book I explain about the various disaster scenarios, from Nostradamus, who says the poles will soon shift, wiping out 97% of mankind, to Sai Baba, who has recently warned his followers to get out of Japan and Australia before March6th this year. The worst part of these predictions is the accuracy record of some of the experts. Will it be a pole shift, a new ice age, a massive solar flare, a comet or asteroid, or even Y2K? I'm getting ready, how about you? $5 (E)

Wayne's Submarine Adventures in WWII: Yes, I spent from 1943-1945 on a submarine, right in the middle of the war with Japan. We almost got sunk several times, and twice I was in the right place at the right time to save the boat. What's it really like to be depth charged? And what's the daily life aboard a submarine like? There are some very funny stories. If you're near Mobile, please visit the Drum. $5 (S)

Improving State Government: Here are 24 ways that almost any state government can cut expenses enormously, while providing far better services. I explain how any government bureau or department can be gotten to cut its expenses by at least 50% in three years and do it cooperatively and enthusiastically. I explain how, by applying a new technology, the state can make it possible to provide all needed services without having to levy *any* taxes at all! Read the book, run for your legislature, and let's get busy making this country work like its founders wanted it to. Don't leave this for "someone else" to do. $5 (L)

Travel Diaries: You can travel amazingly inexpensively – once you know the ropes.Enjoy Sherry and my budget visits to Europe, Russia, and a bunch of other interesting places. How about a first class flight to Munich, a rented Audi, driving to visit Vienna, Krakow in Poland (and the famous salt mines), Prague, back to Munich, and the first class flight home for two, all for under $1,000. Yes, when you know how you can travel inexpensively, and still stay in first class hotels. $5 (T)

Wayne's Caribbean Adventures: More budget travel stories – where I visit the hams and scuba dive most of the islands of the Caribbean. Like the special Liat fare which allowed us to visit 11 countries in 21 days, with me diving all but one of the islands, Guadeloupe, where the hams kept me so busy with parties I didn't have time to dive. $5 (U)

Silver Wire: With two 3" pieces of heavy pure silver wire + three 9V batteries you can make a thousand dollars worth of silver colloid. What do you do with it? It does what the antibiotics do, but germs can't adapt to it. Use it to get rid of germs on food, for skin fungus, warts, and even to drink. Read some books on the uses of silver colloid, it's like magic. $15 (Y)

Classical Music Guide: A list of 100 CDs which will provide you with an outstanding collection of the finest classical music ever written. This is what you need to help you reduce stress. Classical music also raises youngsters' IQs, helps plants grow faster, and will make you healthier. Just wait'll you hear some of Gotschalk's fabulous music! $5 (Z)

Reprints of My Editorials from *73*.

Grist I: 50 of my best non-ham oriented editorials from before 1997. $5 (F)

Grist II: 50 more choice non-ham editorials from before 1997. $5 (G)

1997 Editorials: 240 pages, 216 editorials discussing health, ideas for new businesses, exciting new books I've discovered, ways to cure our country's more serious problems, flight 800, the Oklahoma City bombing, more Moon madness, and so on. In three $5 volumes. $15 (O)

1999 Jan-Aug Editorials: 188 pages in two $5 volumes. Bringing you up to date. $10 (P)

Ham-to-Ham: 45 of my ham-oriented editorials. These will help you bone up on ham history. Great stuff for ham club newsletter filler. Yes, of course these are controversial. $5 (Q)

$1 Million Sales Video: How to generate extra million in sales using PR. This will be one of the best investments your business ever made. $43 (V)

One Hour CW: Using this sneaky method even *you* can learn the Morse Code in one hour and pass that dumb 5wpm Tech-Plus ham test. $5. (CW)

Code Tape (T5): This tape will teach you the letters, numbers and punctuation you need to know if you are going on to learn the code at 13 wpm or 20 wpm. $5 (T5)

Code Tape (T13): Once you know the code for the letters (T5) you can go immediately to copying 13 wpm code (using my system). This should only take two or three days. $5 (T13)

Code Tape (T20): Start right out at 20 wpm and master it in a weekend for your Extra Class license. $5 (T20)

Code Tape (T25): Same deal. It doesn't take any longer to handle 25 wpm as it does 13. Or use the ARRL system & take six months.$5 (T25)

Wayne Talks at Dayton: This is a 90-minute tape of the talk I'd have given at the Dayton, if invited. $5 (W1)

Wayne Talks at Tampa: This is the talk I gave at the Tampa Global Sciences conference. I cover cold fusion, amateur radio, health, books you should read, and so on. $5 (W2)

Stuff I didn't write, but you need:

NASA Mooned America: René makes an air-tight case that NASA faked the Moon landings. This book will convince even you. $25 (R1)

Last Skeptic of Science: This is René's book where he debunks a bunch of accepted scientific beliefs – such as the ice ages, the Earth being a magnet, the Moon causing the tides, and etc. $25 (R2)

Elemental Energy Subscription: I predict this is going to be the largest industry in the world in about 20-30 years. They laughed at me when I predicted the personal computer growth in 1975. PCs are now the third largest industry in the world. The elemental energy ground floor is still wide open, but then that might mean giving up watching ball games and talk shows on the boob tube. $30 for six issues. (EE). A sample issue is $10.

Three Gatto Talks: A prize-winning teacher explains what's wrong with American schools and why our kids are not being educated. Why are Swedish youngsters, who start school at 7 years of age, leaving our kids in the dust? Our kids are intentionally being dumbed down by our school system — the least effective and most expensive in the world. $5 (K)

......*Wayne*

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City-State-Zip ____________________________________

Items ordered - use letters or copy page and mark books wanted. Order total plus $3 s/h in US.$6Can.

______________________________ US$__________

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MC/Visa for orders over $10. #______________________ Expire ______

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Art Bell W6OBB Gets Ready for Y2K

*****3-DIGIT 231

Manuscripts: Contributions for possible publication are most welcome. We'll do the best we can to return anything you request, but we assume no responsibility for loss or damage. Payment for submitted articles will be made after publication. Please submit both a disk and a hard copy of your article [IBM (ok) or Mac (preferred) formats], carefully checked drawings and schematics, and the clearest, best focused and lighted photos you can manage. "How to write for 73" guidelines are available on request. US citizens, please include your Social Security number with submitted manuscripts so we can submit it to you know who.

SEPTEMBER 1999
ISSUE #467

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TABLE OF CONTENTS

FEATURES

DEPARTMENTS

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On the cover: See Wayne's editorial beginning on page 4 for more on W6OBB. We are always looking for interesting articles and cover photos — with or without each other. Your name could be in this space *next* month, and our check could be on its way to *you!* You couldn't use a little extra cash?

Feedback: Any circuit works better with feedback, so please take the time to report on how much you like, hate, or don't care one way or the other about the articles and columns in this issue. G = great!, O = okay, and U = ugh. The G's and O's will be continued. Enough U's and it's Silent Keysville. Hey, this is *your* communications medium, so don't just sit there scratching your...er...head. FYI: Feedback "number" is usually the page number on which the article or column starts.

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Contract: By being so nosey as to read this fine print, you have just entered into a binding agreement with *73 Amateur Radio Today*. You are hereby obligated to do something nice for a ham friend—buy him a subscription to *73*. What? All of your ham friends are already subscribers? Donate a subscription to your local school library!

Number 1 on your Feedback card

NEVER SAY DIE

Wayne Green W2NSD/1
w2nsd@aol.com

Art Bell W6OBB

You probably don't spend much time listening to AM radio. But if you do, and you've ever tuned in at night, you've heard Art's coast-to-coast talk show "from the Kingdom of Nye" all up and down your dial. That's Nye County, Nevada, by the way.

In the East, his show is on the air five nights a week from 1 until 6 AM, which means that if you're a 9-to-5er, unless you turn on your radio during a sandbox visit, you'll probably never hear him. I keep a little Sony ICF-SW1, a 3" x 4" x 1" allband digital radio, by my bed, so all it takes is a push of the on-off button and I'm listening to WPTH out of Philadelphia on 1210, New York's WABC on 770, or WTAM Detroit on 1100.

On weekends, the show is a little shorter and consists mostly of repeats of his best shows.

The usual format has a news broadcast for about 8 minutes on the hour and half hour. The first hour of Art's show has him bringing you up to date on some of the latest happenings he thinks you'll want to know about. That's usually followed by listener call-ins, where they can discuss whatever they want. The next four hours normally feature an interview with a guest, and Art's been able to get some fascinating guests. I know I've learned a lot from them — and so have you, via my resulting editorials.

The topics covered are all over the lot — those strange contrails that are making us sick, time travel, UFOs, contactees, alien technology, a space hotel in the works, those incredible crop patterns, ghosts, reverse speech, remote viewing, Area 51 visits, and so on.

No, of course I don't sit up five hours a night so I won't miss anything. I record the program every night. And you should be doing this, too. All you need is a cable between your AM radio and a VCR and you're in business. For the technically challenged, I have my $5 Wayne Green's Bell Saver Kit (see p. 63) that includes the needed cable and complete instructions on connecting it and programming your VCR. In this way, you can listen to the show when it's convenient for you. You can fast forward through anything that doesn't interest you (like the newscasts). When there's a phone number or Web site address you want to note, you can rewind and get it. And if there's a guest you want to listen to again, or want to play for someone else to hear, you can save the tape, keeping a note of the time on the tape that you want to find. I have several boxes of tapes I've saved for reference. They're not quite as handy as books, but if you keep an index in your computer, they're easy to find. The T-120 tapes will record 6 hours, and you can find 'em for a buck, if you watch the ads.

Art is seriously geared up for the Y2K crisis, with an emergency generator, solar power, and wind power backup. You'll be hearing W6OBB on the bands even if the power grid goes down for months.

Art does his program from his home in Pahrump, Nevada. You can watch him do the show, if you're up, via video on www.artbell.com. You can also listen to it via his Web site and see a list of his coming and past guests. If you look me up you'll see that I've been a guest five times and we've talked about all sorts of things. You can even listen to these past shows.

I'm anxious to be on more so that we can talk up amateur radio and encourage more people to come into the hobby. Well, the ARRL doesn't seem to be doing a damned thing, so *someone* has to do it.

Plummeting

The number of new licenses issued in January has dropped by almost 50% in the last two years. Hey, get out some graph paper and plot it for yourself. Plot 1553-1053-871 for the last three years and see where things are heading! The line hits zero around 2010.

The situation isn't any better when it comes to upgrades, either. They, too, are down 50% in the last two years.

Unless you can somehow force your ARRL director to make the League honor its responsibility to preserve the hobby, it looks like we're crashing and burning.

Why am I leaning so hard on the ARRL about this? Well, there are only two other interested parties, the FCC and the ham manufacturers. As far as the FCC is concerned, amateur radio is an expensive nuisance, and the ham manufacturers are unorganized and apparently uninterested in whether the hobby continues or not.

Thus, whether amateur radio survives this crisis or not seems totally dependent on the ARRL taking some serious action. If they can't be forced to start promoting the hobby, we be gone.

There isn't any big secret about what needs to be done. I've written about it enough times, so I won't rehash my advice. Mostly, the League needs to figure out how to rebuild the high school radio club infrastructure they wiped out in 1964. That was our largest source of new hams.

It's going to be tough, for in addition to sports and TV, now we've got the Internet as a competitor for the teenagers. The League has to get kids to think of ham radio as cool. Now, there's a challenge!

A Slight Tinkering

With the ARRL membership dropping almost 10% (plummeting) in the last year; with *QST* shrinking; with manufacturers and dealers going out of business all around the country; with the number of new Techs dropping about 30% in the last two years; with the number of Techs upgrading to General dropping even faster; I then look over the ARRL's comments to the FCC on restructuring the hobby and all I see them recommending is a slight tinkering. What does it take to get alarm bells to go off in the atrophied brains of the directors you keep on blindly reelecting?

For that matter, what is it going to take to get our oldtimers to recognize that the world has changed and that if amateur radio is going to survive, *it* has to change, too? I'm talking major changes, not tinkering.

Fifty years ago, amateur radio made a lot of sense as a service. In addition to providing engineers and technicians

Continued on page 41

Number 6 on your Feedback card

QRX . . .

FCC Sets New Vanity Fee

The cost of getting a vanity callsign is going up — but only a dollar. This as the FCC raises the fee to apply for an amateur radio vanity callsign from $13 to $14 starting September 10th.

By the way, the vanity callsign system is still gaining in popularity. The FCC says that it receives in excess of a thousand vanity applications per month.

Thanks to the FCC, via *Newsline*, Bill Pasternak WA6ITF, editor.

Speaking of Which ...

Readers of our QRX column, along with many, many thousands of listeners elsewhere, via repeater, are well familiar with *Newsline*, amateur radio's hard-working, not-for-profit, totally independent, nonbiased news service. Well, although they haven't requested us to do so, we are here to ask you to lend them a hand financially.

Like most nonprofits of this type, they face a constant battle in making ends meet in order to provide their valuable service. So whaddya say? Let's help them start out the new millennium on solid footing by making as large a contribution as you can to: Newsline Support Fund, Post Office Box 660937, Arcadia CA 91066. Be sure to mention that you're a *73* reader, too, so we can show them how much *our* folks *care* about the ARS.

They'll thank you, we'll thank you, and so will believers in a free press everywhere ... Please do it today, while you're thinking about it.

Abbott and Costello Meet Windows

Costello: Hey, Abbott!

Abbott: Yes, Lou?

Costello: I just got my first computer.

Abbott: That's great, Lou. What did you get?

Costello: A Pentium II-266, with 40 megs of RAM, a 2.1 gig hard drive, and a 24x CD-ROM.

Abbott: That's terrific, Lou.

Costello: But I don't know what any of it means!

Abbott: You will in time.

Costello: That's exactly why I'm here to see you.

Abbott: Oh?

Costello: I heard that you're a real computer expert.

Abbott: Well, I don't know ...

Costello: Yes-sir-ee. You know your stuff. And you're going to train me.

Abbott: Really?

Costello: Uh-huh. And I am here for my first lesson.

Abbott: OK, Lou. What do you want to know?

Costello: I am having no problem turning it on, but I heard that you should be very careful how you turn it off.

Abbott: That's true.

Costello: So, here I am working on my new computer, and I want to turn it off. What do I do?

Abbott: Well, first you click the Start icon, and then ...

Costello: No, I told you I want to turn it off.

Abbott: I know, you click the Start icon.

Costello: Wait a second. I want to turn it off. I know how to start it. So tell me what to do.

Abbott: I did.

Costello: When?

Abbott: When I told you to click the Start icon.

Costello: Why should I click the Start icon?

Abbott: To shut off the computer.

Costello: I click Start to stop?

Abbott: Well, Start doesn't actually stop the computer.

Costello: I knew it! So what do I click?

Abbott: Start.

Costello: Start what?

Abbott: Start icon.

Costello: Start icon to do what?

Abbott: Shut down.

Costello: You don't have to get rude!

Abbott: No, no, no! That's not what I meant.

Costello: Then say what you mean.

Abbott: To shut down the computer, click ...

Costello: Don't say "Start"!

Abbott: Then what do you want me to say?

Costello: Look, if I want to turn off the computer, I'm willing to click the Stop button, the End button, and the Cease and Desist button, but no one in their right mind clicks the Start to stop.

Abbott: But that's what you do.

Costello: And you probably go at Stop signs, and stop at green lights.

Abbott: Don't be ridiculous.

Costello: I'm being ridiculous? Well, I think it's about time we started this conversation.

Abbott: What are you talking about?

Costello: I am starting this conversation right now. Good-bye!

Thanks to the September 1998 electronic issue of the *TSRC Monitor*, the newsletter of the Twin States Radio Club, Mike Maynard WB1GRR, editor, via the November 1998 *ARNS Bulletin*.

Groaners

Floating around the Internet (brace yourself):

Two Eskimos sitting in a kayak were chilly, but when they lit a fire in the craft, it sank, proving once and for all that you can't have your kayak and heat it, too.

Two boll weevils grew up in South Carolina. One went to Hollywood and became a famous actor. The other stayed behind in the cotton fields and never amounted to much. The second one, naturally, became known as the lesser of two weevils.

A neutron goes into a bar and asks the bartender, "How much for a beer?" The bartender replies, "For you, no charge."

Two atoms are walking down the street and they run into each other. One says to the other, "Are you all right?" "No, I lost an electron!" "Are you sure?" "Yeah, I'm positive!"

Did you hear about the Buddhist who refused his dentist's Novocain during root canal work? He wanted to transcend dental medication.

A group of chess enthusiasts checked into a hotel and were standing in the lobby discussing their recent tournament victories. After about an hour, the manager came out of the office and asked them to disperse. "But why?" they asked, as they moved off. "Because," he said, "I can't stand chess nuts boasting in an open foyer."

A doctor made it his regular habit to stop off at a bar for a hazelnut daiquiri on his way home. The bartender knew of his habit, and would always have the drink waiting at precisely 5:03 p.m. One afternoon, as the end of the workday approached, the bartender was dismayed to find that he was out of hazelnut extract. Thinking quickly, he threw together a daiquiri made with hickory nut and set it on the bar. The doctor came in at his regular time, took one sip of the drink and exclaimed, 'This isn't a hazelnut daiquiri!" "No, I'm sorry," replied the bartender, "it's a hickory daiquiri, doc."

A hungry lion was roaming through the jungle looking for something to eat. He came across two men. One was sitting under a tree and reading a book; the other was typing away on his typewriter. The lion quickly pounced on the man reading the book and devoured him. Even the king of the jungle knows readers digest and writers cramp.

There was a man who entered a local paper's pun contest. He sent in ten different puns, in the hope that at least one of the puns would win. Unfortunately, no pun in ten did.

A guy goes to a psychiatrist. "Doc, I keep having these alternating recurring dreams. First I'm a teepee, then I'm a wigwam, then I'm a teepee, then I'm a wigwam. It's driving me crazy. What's wrong with me?" The doctor replies: "It's very simple. You're two tents."

A woman has twins and gives them up for adoption. One of them goes to a family in Egypt and is named "Emal." The other goes to a family in Spain; they name him "Juan." Years later, Juan sends a picture of himself to his birth mom. Upon receiving the picture, she tells her husband that she wishes she also had a picture of Emal. Her husband responds, "But they're twins—if you've seen Juan, you've seen Emal."

Thanks (we think) to the September 1998 issue of the *SCCARA-GRAM*, the newsletter of the Santa Clara County ARA, Gary Mitchell WB6YRU, editor, via the February 1999 *ARNS Bulletin*.

Spell Checker

Eye halve a spelling chequer
It came with my pea sea
It plainly marques four my revue
Miss steaks eye kin knot sea.

Eye strike a key and type a whirred
And weight four it two say
Weather eye am wrong oar write
It shows me strait a weigh.

As soon as a mist ache is maid
It nose bee fore two long
And eye can putt the air oar rite
Its rarely ever wrong.

Eye have run this poem threw it
Eye am shore your pleased two no
Its let her purr fact in it's weigh
My chequer tolled me sew.

— Sauce unknown

We adapted this from the February 1999 *ARNS Bulletin*, reprinted from the November 1998 issue of the *Peconic ARC Newsletter*, Ralph Grover NS2S, editor.

Swifties

Remember Tom Swifties? Well, here are a few to keep you up late at night gagging.

"I can't believe I ate the whole pineapple!" said Tom dolefully.

"That's the last time I ever pet a lion!" said Tom offhandedly.

"I'll never sit on the tracks again," Tom said beside himself.

"That's the third electric shock I've gotten this week," Tom said, revolted.

"I'm never anywhere on time," Tom related.

"There is more than one way to skin a cat," Tom deferred.

"That car you sold me has defective steering." Tom said, straightforwardly.

"I've been on a diet," Tom expounded.

"I'll have to send that message again," Tom said remorsefully.

"I keep banging my head on things," Tom said bashfully.

"Look at that jailbird climb down the wall," Tom observed with condescension.

"I remember the Midwest being flatter than this," Tom explained.

"I'll have to dig another ditch around the castle," Tom sighed, remotely.

"I've lived through a lot of wind storms," Tom regaled.

"That's the third time my teacher has changed my grade," Tom remarked.

"I haven't caught a fish all day," Tom said without debate.

"That mink coat is on wrong side out," Tom inferred.

Continued on page 37

LETTERS

Number 8 on your Feedback card

From the Ham Shack

Ronald Stier W9ICZ, Carmel IN. While scanning your July editorial, I hit upon your request for input on the Kachina.

A long story short: Two years ago, I began to pursue my design and buildup of a digital transmitter and receiver. My intent was to provide a retirement income. A couple of boards and many hours of software later, I saw the Kachina ad. Subsequently there was a review in your publication. Some additional reading at the Kachina Web site convinced me to put the boards on the junk pile and go after the unit. It is a great rig.

Comparison testing with my Kenwood 940 provided readable signals that probably never got past the first stage of the Kenwood. The unit can be brought up quickly without knowing all of the bells and whistles. The software provides intuitive use. I did not get the hand-tuning knob and at this point see no reason to do so.

Since obtaining the unit, I have obtained two software upgrades from the Kachina Web site. Both have provided good improvements. The Web provides in-depth technical documentation on all aspects of the unit. It is heavy reading and requires good technical background.

One area that I would like to see improved is the automatic antenna tuner. In theory, it provides a wide range for matching. In practice, it does not, and I use my handy-dandy antenna tuner. The Smith chart readings and their retention make it very easy to readjust my vertical.

Wayne, I don't wish to bore you further, but I wanted to respond to your request because I think that the Kachina will be at my station for a long time.

Here are some user comments I picked up from the Kachina Web site (www.kachina-az.com). If they'd get it so it would work with a Mac instead of a (ugh!) PC, I'd get one in a blink. I've been asking in my editorials for user comments on any new equipment anyone has tried and liked, but with few takers. Maybe this will chum the waters. ... Wayne.

Jim K2ZF. I have had my Kachina a month now and am jumping for joy. It is truly one of the best radios I have ever owned. I have two other rigs sitting here on my desk and have not turned one of them on since I have received this radio, just amazing! The receiver is not deaf, it hears everything. I am CW-only here and am very critical about the CW performance of my radios. I have been known to buy a radio and sell it a few months later, not this one! One great radio, guys.

David WB2KTM. The service and wonderful way you treat Kachina owners is a breath of fresh air in this day and age. I know I will never regret my choice of new equipment upon returning to amateur radio after four years away from our hobby. I will be a proud 505DSP owner in my retirement years. Keep up the good work.

Steven Weinstein K2WE. Greetings, I have had my 505DSP for about 6 months now. It's an amazing piece of equipment. I just worked a 3B on 40 meters with one call. I could barely hear him on my old rig. He was perfect copy on the Kachina.

Ward Trammell WA5RD. The radio is a joy to operate. My amateur radio love at present is the digital modes, primarily PACTOR. The built-in digital filters make this operation the easiest I have ever worked, and my RTTY operation dates back to 1948 as a Navy radioman. I like the radio so much, my old rig is for sale.

Donald Urbytes W8LGV. I believe this radio is the best on the market today, and I am proud to own a radio of this quality. Please keep up the good work.

Bob Resconsin W1TRF. There's just no way that I can tell you how happy I am, not only with my Kachina, but also with the response I've had with everyone out there. The radio is outstanding, and the organization is super!

Jon Englert N2OSZ. I've been meaning to write you for a very long time. First of all, I enjoy reading your editorials very much — keep up the good work. Also, you have been somewhat of an inspiration to me. I used to smoke two packs of cigarettes a day and did virtually nothing else. I quit smoking three years ago, now work out four times a week and run 6.5 miles five days a week. I am forty-three years old and have more energy than I did when I was twenty years old. I am running in 5k races now and coming close to placing. Can't imagine I would ever be doing this.

This summer, I picked up some old ham magazines at the local hamfest. They are mostly from the late fifties and early sixties. What surprises me the most is what hams were arguing about back then. The same stuff they argue about now! For instance, how high the words-per-minutes [should be] to keep away the "lids"; taking away band space from undeserving Novices; I build therefore I'm better (Did these old guys really build that much?). You could probably print these same letters in your mag today, change the dates, and nobody would know the difference.

You are right, something needs to be done to keep this great hobby alive. Not a day goes by that I don't devote at least a little thought to what I could be doing to advance the hobby. I don't think I would be giving much thought to it if not for your editorials. You keep writing and I'll keep thinking of things I can do.

By the way, I made Extra using your code tapes, not Brand X.

Okay, if you insist, I'll keep writing. And you're right about the '50s hams not building. We built in the '30s because there were no commercially made transmitters, but we didn't know what we were doing. ... Wayne.

Teal Powell, Vallejo CA. I love reading your Never Say Die. Some powder for your firecracker: In Marin county (one of the richest counties in the state), there is a town called Sausalito. Anyway, they spend more than twice as much per student than the average — $13,000 — and they are in the bottom 10% of the state results-wise. My point is that money doesn't buy an education! Keep up your good work.

Anyone who buys the teacher's union mantra about there being any correlation between school costs and SAT scores needs to read Inside American Education *by Thomas Sowell, which I review in my* Secret Guide to Wisdom. ... *Wayne.*

Ben Alabastro W1VM, Rutland VT. After *not* receiving the mysterious April 1999 issue of your magazine, I almost got mad and wanted to cancel my subscription. But then I would be sorry. And then I would feel bad. And then I would have to beg to re-subscribe. And then I would be at your mercy. And then I would have to send you six QSL cards to beg you to let me re-subscribe. And then I would be sad if you didn't. So you see, by *not* having an April 1999 edition of your mag, I can still read it and not lose any sleep over the matter.

PIC Key, PIC Key

This simple CW keyer is a great way to learn about PICs.

Vladimir A. Skrypnik UY5DJ
Pravdinska - 58
Kharkiv - 107
Ukraine - 310107
[uy5dj@yahoo.com]

Do you recall this phrase: "These simple projects should whet your appetite to learn more about the little PIC microcontrollers you see so frequently"? This comment preceded the article "Using PIC Microcontrollers in Amateur Radio Projects," by John Hansen W2FS, in the October 1998 issue of *QST*. This prediction was certainly true for me! Before reading that article, I was not at all familiar with PIC microcontrollers. To me, they were *terra incognita*. But the article encouraged me to begin learning about PICs by experimenting with programming and by producing my first projects. This article is a direct result of John Hansen's prediction.

PIC microcontrollers, a new generation of electronic components, provide us with fascinating possibilities of eliminating early-on rather large numbers of discrete elements by utilizing the power of programming to provide needed functions. The large printed circuit board, with its multiple conductors performing functional connections between parts of schematics, is supplanted by an invisible program stored in memory inside a single, small chip. The small size of a circuit board containing a single PIC microcontroller, along with a very few discrete components to accomplish input/output functions, belies the latent power of the program stored within the PIC.

The main challenge for the PIC designer is to create a program to implement the project idea. This is a daunting first-time task—at least it seems so before you begin your study of microcontrollers. I have found that the best way to study is learning-by-doing. To begin with, all you need for your home lessons is David Benson's book (see Notes at end of article). This easy-to-understand manual will introduce you to PIC microcontrollers from the inside. Stepping from page to page, you will acquire increasing ability by learning to write simple programs and then checking them with the MPLAB media (see Notes).

Algorithm of simple keyer program

Let's review how an ordinary keyer works. Let's assume that the keyer's output is connected to the transmitter keying circuitry. Inputs are connected to the left and right contacts of the keyer's paddle. Normally, the keyer is in the idle condition: The output is open (or high) and the transmitter is not activated. When the operator presses the paddle handle to the "Dot" contact, the output becomes active and drives either a relay or a transistor connecting the keying circuit to ground and the transmitter starts sending a Morse code dot. The keyer supplies the appropriate length of the dot, as well as a pause in sequence. The durations of both the dot and the pause are equal. When the paddle returns to the neutral position, the keyer, once again, assumes the idle condition. If the paddle is pressed and held in the "Dot" position, the keyer performs a precise series of dots and pauses. The same is true when the operator presses the paddle to the "Dash" position. However, the length of a dash is three times longer than the length of a dot.

Forming precise dots, dashes, and pauses, as described above, will be accomplished by the PIC's program, and a coherent microcontroller program must have a coherent plan; such a plan is generally called an algorithm. **Fig. 1** depicts the algorithm for our project keyer. Referring to **Fig. 1,** keep in mind that the microcontroller, PIC16F84, has 5 lines of port A and 8 lines of port B.

Any line of port A or B can be used as either an input or an output. In this project, we will connect the dot and dash paddle contacts to the port A lines, which will function as inputs. Keyer output and piezo buzzer for audio monitoring will be connected to port B as outputs.

Now, let's examine the operation algorithm diagram, **Fig. 1**. All working steps are marked with rectangular boxes. Box "Start" is the point where the program will actually start to run. When supply voltage is applied to the keyer, the first step in the program is to instruct all port A lines to function as inputs. In the next steps, all lines of port B are instructed to function as outputs, and they also are switched to normal low output levels. Up to this point, the program has only prepared the PIC microcontroller. But continuing from this point, the program will begin to run in the normal idle operation of the keyer. This is marked by the label "BEGIN" on the diagram.

Let me digress a bit from the algorithm diagram and explain how certain dot, dash, or pause durations will occur in the keyer operation. PIC microcontrollers act by stepping under internal clock pulses. Every step is called out as a cycle. Each command instruction has some quantity of instruction cycles. I will not describe each one, or how many cycles it will require. I only want to point out that in order to produce a certain length of dot, we need to calculate how many instruction cycles the microcontroller will use for providing the operation, and how many to add for delaying cycles to establish the proper relationship between transmitting speed and Morse code elements. Delay duration depends upon the delay constants we will incorporate into the program. There are three different constants used: one each for the dot, dash, and pause. There are three counters nominated in the file register's internal memory area. To provide the desired delay, the constants will be put into their appropriate counters.

But let's now return to the algorithm. The box closest to the "BEGIN" label is initialization of the counters. Initialization means to clear counters

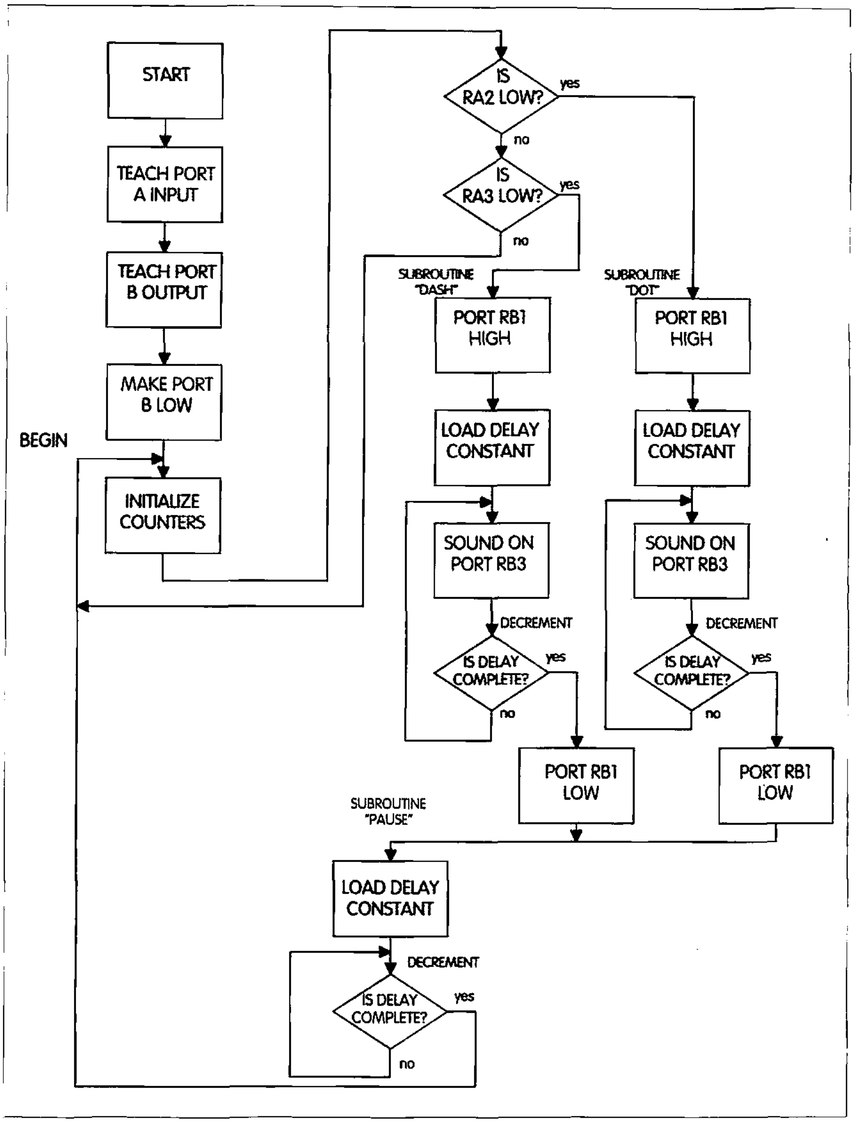

Fig. 1. Operation algorithm for the PIC-controlled keyer.

to make them ready for the next operation. The keyer program now sequentially checks to determine if the dot or dash paddle contacts are closed or not. First, it checks the dot input. If port line RA2 is low, the program will call the subroutine "Dot." This is depicted by the right comparison rhomb corner marked with "Yes." If not, RA2 is still high, which means that the dot paddle contact was not closed, and the program will go to check the status of the dash input. If the dash paddle contact is pressed to make port RA3 low (yes), the program will call subroutine "Dash" to form a dash. If not (the dash paddle contact not closed), it will return to the beginning point and continue to run this loop until "Yes" (a dot or dash paddle contact closure) occurs on one of the comparison rhombs.

Let's consider what will happen when the dot is pressed and the keyer begins forming the duration of the dot mark to key the transmitter. First, we have to make the keying output port line RB1 go high. This will cause the transmitter connected to the keyer to start transmitting a dot.

The next box on the algorithm diagram tells us that we have to load the delay constant into the counter. After that, the program will start to generate a sound pulse sequence to operate the monitoring buzzer.

The next rhomb is for decreasing the

counter number by one unit and checking to see if it is equal to zero or not. If the answer is no, this loop will continue until the delay is completed, and then the number in the counter will be decreased to zero. This will cause an exit from this point to the "Yes" direction, and it will make the output port line RB1 low. This means that dot is completed and the transmitter stops transmitting. The same procedures are followed for producing the dash—except that the program will operate under the control of the "Dash" subroutine when it will find a low level on the input port line RA3. The only difference is the delay constant, which is much larger to produce the dash that is three times longer than the dot.

In both cases, when either the "Dot" or "Dash" routine is completed, and the RB1 port line goes low, it will start the subroutine "Pause." This routine must generate a pause between Morse code elements equal to the length of one dot. Note that here we are not including the provision of the audio monitoring signal, which takes some amount of instruction cycles. This pause is controlled by another delay constant—a bit larger one—than the one used for the dot. Subroutine "Pause" works in the same manner as the routines for forming the length of the dot and dash, except that it has its own unique constant loaded into its counter. The delay constant number in the pause counter is decreased by one unit until it is zero. When pause is completed, the program returns to the point labeled "BEGIN" to check for dot or dash inputs by the operator, and the keyer's PIC microcontroller continues to repeat this action until power is turned off.

;--			
list		p=16f84	
__config		0x3ff3 ; RC clock oscillator	
;--			
; CPU equates (memory map)			
porta	equ	0x05	
portb	equ	0x06	
count1	equ	0x0c	; for DOT delay constant
count2	equ	0x0d	; for PAUSE delay constant
;--			
	org	0x000	
start	mov1w	0xff	
	tris	porta	; teach port A inputs
	mov1w	0x00	
	tris	portb	; teach port B outputs
	clrf	portb	; all port B lines low
;			
begin	clrf	count1	; initialize counters
	clrf	count2	
	clrf	count3	
;-------------------- DOT --------------------			
	btfsc	porta,2	; is RA2 low (dot pressed)?
	goto	dash?	
	call	dot	; calling subrouting DOT
	goto	begin	
;-------------------- DASH --------------------			
dash?	btfsc	porta,3	; is RA3 low (dash pressed)?
	goto	begin	
	call	dash	; calling subrouting DASH
	goto	begin	

;---------------- subroutine DOT ----------------			
dot	bsf	portb,1	; RB1=1, dot begins
	mov1w	d'12'	; delay constant
	movwf	count1	; load const to counter
rptdot	bsf	portb,3	; sound on
	bcf	portb,3	; sound off
	decfsz	count1,f	; decrement counter
	goto	rptdot	; not 0
	bcf	portb,1	; RB1=0, end dot
	call	pause	; start PAUSE subroutine
;---------------- subroutine DASH ----------------			
dash	bsf	portb,1	; RB1=1, dash begins
	mov1w	d'37'	; delay constant
	movwf	count3	; load const to counter
rptdsh	bsf	portb,3	; sound on
	bcf	portb,3	; sound off
	decfsz	count3,f	; decrement counter
	goto	rptdsh	; not 0
	bcf	portb,1	; RB1=0, end dash
;			
	call	pause	; start PAUSE subroutine
	return		
;---------------- subroutine PAUSE ----------------			
pause	mov1w	d'14'	; delay constant
	movwf	count2	; load counter with delay const
rptpau	decfsz	count2, f	; decrement counter
	goto	rptpau	; not 0
	return		; counter 0, end pause
;			
;---------------- END of program ----------------			
	end		

Table 1. An assembly language program for PIC keyer.

An assembly language program

The assembly language program for the keyer is presented in **Table 1**. Assembler software will examine this program and ignore all lines beginning from the semicolon. Others perform assembly source code. This part will be assembled by MPASM, the compiler included into the MPLAB integrated development environment from Microchip. The assembler will convert readable text files into hexadecimal code for programming the PIC microcontroller.

The line beginning with the word "list" informs the assembler what type of a PIC microcontroller is used. The next line determines the type of internal clock oscillator built into the device. In this case, it is an RC-type oscillator.

The next five lines are equating statements which assign hexadecimal addresses to file registers in the PIC memory area. The line with ORG (origin) defines the address in memory where the program code starts.

The line with the label "start" in the first column of the program will teach all port A lines to function as inputs by loading hexadecimal FF (or binary 1111 1111) into a special tristate register. Actually, this instruction only needs five "1's," because port A has five input/output lines (named as RA0–RA4) in this type of PIC. Therefore, the three "1's" in the left "F" are functionally superfluous. In like manner, the program will teach all port B lines to function as outputs by loading hexadecimal 00 (binary equivalent is 0000 0000) into this register. The Port B register is also cleared, which means low level statements for each of the eight output lines RB0–RB7.

The label "BEGIN" shows the point where delay counters are cleared. When all three counters are ready, the program begins the "Dot" portion. Here the program checks for the low level at the input port RA2. Electrically, this point is wired to the dot contact of the paddle. If bit 2 of port A is high (paddle is not pressed to dot) in accordance with the instruction "goto," the program goes to the "Dash" portion. However, if bit 2 of port A is low, the next executed instruction will be "call." This means call the Dot subroutine.

In the first subroutine, the line labeled as "dot," bit 1 of the port B is set to "1." This high level will activate the transmitter's keying circuitry to start transmitting a dot. The next two program lines load decimal value "12" (the delay constant) into counter 1. Following this step, the program begins to generate signals for the buzzer. Instruction "bsf" sets to "1" bit 3 of port B. If you remember, previously we made all port bits low. Now RB3 goes high and the buzzer produces one click. But in the next step instruction, "bcf" makes this output low, causing a new click. A fast repetition rate transforms the clicks into a tone.

Instruction "decfsz" decrements counter 1 contents by one unit and compares the result with zero. Until zero has been reached, the instruction "goto" loops to the label "rptdot" to produce new clicks, and continues to decrement the counter until the content of the counter becomes zero—then the following instruction "bcf" will make RB1 low. The dot is now over and the transmitter no longer transmits RF energy.

But subroutine "Dot" isn't over. Instruction "call" will execute another subroutine, "Pause." This begins by loading decimal value "14" (delay constant) to counter 2. The next instruction decrements this counter until the delay is complete and the counter is clear. Note that output port lines RB1 and RB3 are not used in this subroutine. We do not need to either key the transmitter or produce sound. We only need to get a standard length pause equal to the length of one dot. The pause for the audio signal is controlled by counter 2 and a much larger delay constant.

When subroutine "Pause" is over, instruction "return" returns us to subroutine "Dot." But the last instruction here also is "return," and the program goes back to the "Dot" portion. From there the program jumps to the point labeled "BEGIN" to initialize counters again, and starts checking which contact on the paddle is being pressed.

Subroutine "Dash" is the same as

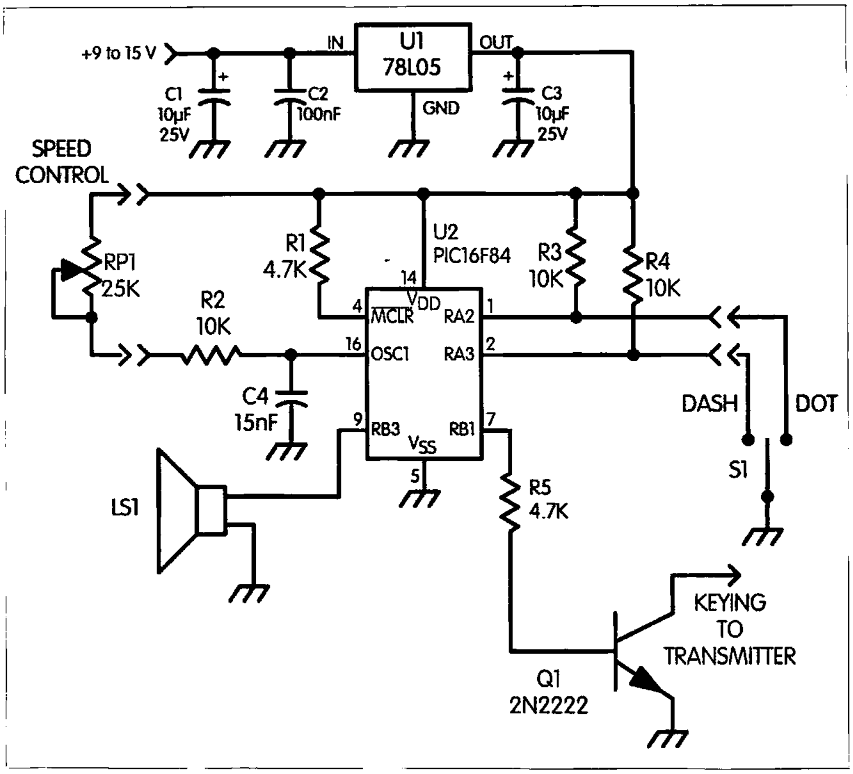

*Fig. 2. Schematic of the simple PIC CW keyer. Unless otherwise specified, resistors are 1/4 W, 5% tolerance, carbon-composition or film units. Appropriate equivalent parts from Digi-Key (DK) can be substituted as shown in **Table 2**.*

subroutine "Dot." It is followed by subroutine "Pause" as well. The only difference is in delay constant value. The decimal equivalent is "37," which makes the dash duration almost three times larger than the dot or pause.

Circuit description

Refer to the schematic diagram, **Fig. 2**. The circuit is powered from +5 V voltage regulator U1. Capacitors C1 and C3 provide clear DC, and C2 is for suppression of incoming RF energy from the transmitter.

The keyer itself is microcontroller U2. Resistor R1 keeps the reset input on pin 4 high. Resistors R3 and R4 are pull-up resistors for inputs RA2 and RA3. They provide high idle level at the paddle's dot and dash contacts. Note that I do not specify left or right contacts on the paddle because that is a matter of the operator's taste.

Onboard components R2 and C4 together with outboard potentiometer RP1 are the RC circuitry for the internal clock oscillator. With the component values shown here, the transmitting speed varies from approximately 5 wpm to over 30. To make a more narrow speed range, you may use a higher value of R2.

Signal from pin 7 of U2 is used for keying the transmitter. Q1 functions as a bipolar switch to key the transmitter keying circuitry. When port RB1 goes high it turns Q1 on, thereby connecting the collector network to ground. Resistor R5 is for limiting base current.

The piezo buzzer, connected to pin 9, monitors the transmitted Morse code text. There is another unusual function of the buzzer. You will notice that the buzzer's pitch is related to the clock speed of the microcontroller. When the operator varies the Morse transmission speed by rotating the knob on RP1, it will also vary the sound pitch. At first this may seem like a disadvantage, but the positive effect of this is to make it possible to estimate desired Morse speed just by listening to the pitch of the tone. The lower the tone of one dot, the lower the Morse speed. No need to overload the band with a series of dots to check the transmitting speed. This, of course, is true only for the buzzer's tone, not for the signals heard from your station headphones! Your transceiver uses other methods to get a monitoring tone.

Construction

The keyer was built on a 30 x 35 mm glass-epoxy single-sided PC board (see **Fig. 3**). If you notice my name and callsign, you will understand why metric sizes were cited. Customary English dimensions are approximately 1-1/4 x 1-3/8 inches. I am not familiar with companies outside of the Ukraine that produce custom boards in small quantities. However, I think it is normal practice for radio amateurs to make their own boards.

The assembled board can be installed into almost any transceiver. Limitations will be either not enough room in its case (which seems incredible) or some specific feature of the keying circuitry such as keying with high sink current or high voltage above ground. In this situation, transistor Q1 should be used to drive a small relay with open contacts. Don't forget to include a small silicon diode across the relay coil to manage the inductive spike when the relay coil is de-energized (and, of course, do ensure that

Parts List	
Designation	Part
S1	Any type CW keyer paddle
C1, C3	10 µF, 25 V electrolytic or tantalum (DK P5148-ND)
C2, C4	Ceramic (C2: DK P4924-ND; C4: DK P4905-ND)
LS1	Piezo buzzer element (DK P9924-ND)
RP1	25 k potentiometer (DK CT2266-ND)
U1	78L05 small 5 V positive regulator (DK NJM78L05-ND)
U2	PIC16F84 microcontroller (DK PIC16F84-04/P-ND)
Q1	2N222 or any general purpose NPN silicon transistor (DK PN2222ADICT-ND)

***Table 2.** Parts list.*

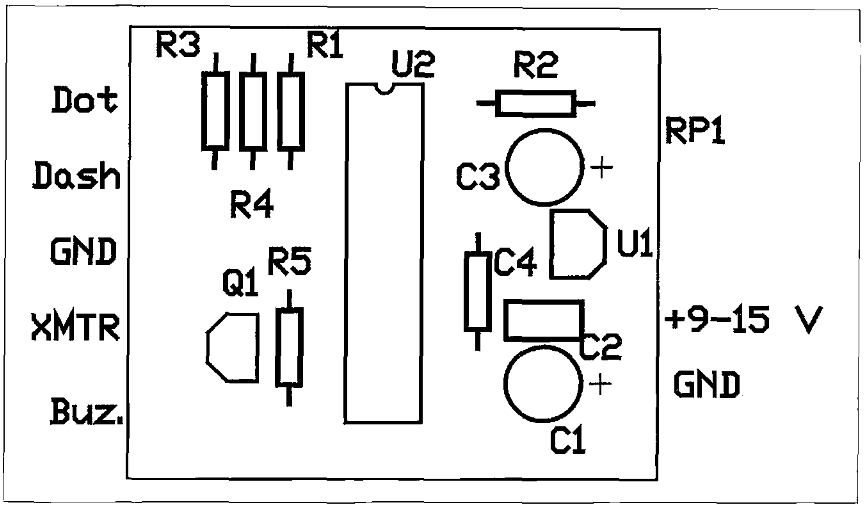

Fig. 3(a). PIC keyer printed circuit board, component side.

the polarity is correct and the diode is not DC conductive when the relay coil is energized).

It is wise to install the keyer board directly onto the keyer paddle assembly. This will ensure the shortest possible input wires, and keep it away from strong RF fields. A metal enclosure to further shield against RF energy in your shack is also a wise idea. The accompanying photo reveals that my keyer is an improvisation (which in the Ukraine is standard procedure due to the cost of living and scarcity of manufactured electronic parts). It is mounted on an old-fashioned telephone polarized relay modified as a paddle. But this is also the amateur radio tradition, and I'm sure you will conjure up your own unique improvisations.

Programming

First of all, you have to work with your assembler program in Microchip's MPLAB software. This is the best environment for design and debugging your programs. This software can be obtained free from the Microchip Web site (see Notes). The assembler compiler MPASM is included in MPLAB and also supplied separately. It may be used to obtain source files for the programmer, but I prefer to use the whole MPLAB package. On the Web site, you will also find a manual for the newest version of MPLAB, with detailed explanations on how to work with this software.

The results of your work in MPLAB will be a file with extension *.hex. It should be used in programming software PIX (see Notes, note 3). Also, you will need the programmer itself. I am using the simple serial port programmer, which was included (along with a detailed description and operating procedure) in W2FS's article.

Summary

This simple keyer is an example of gaining knowledge and skills by self-study, experimentation, and construction—and you end up with a very useful station accessory as well! And, of course, like most amateur radio projects, the project itself is ripe for further improvements and modifications. Keep in mind that the program described in this short article utilizes only a very small part of PIC16F84 capabilities.

In closing, I would like to express my heartiest gratitude to my friend Dave Evison W7DE for his valuable remarks and comments.

Notes

1. David Benson, "Easy PIC'n. A Beginner's Guide to Using PIC 16/17 Microcontrollers." Version 3.0, Square 1 Electronics, 1997.
2. Available at [http://www.microchip.com].
3. Available at [http://home5.swipnet.se/~w53783].

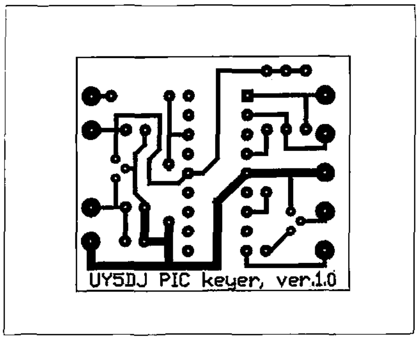

Fig. 3(b). PIC keyer printed circuit board, soldering side.

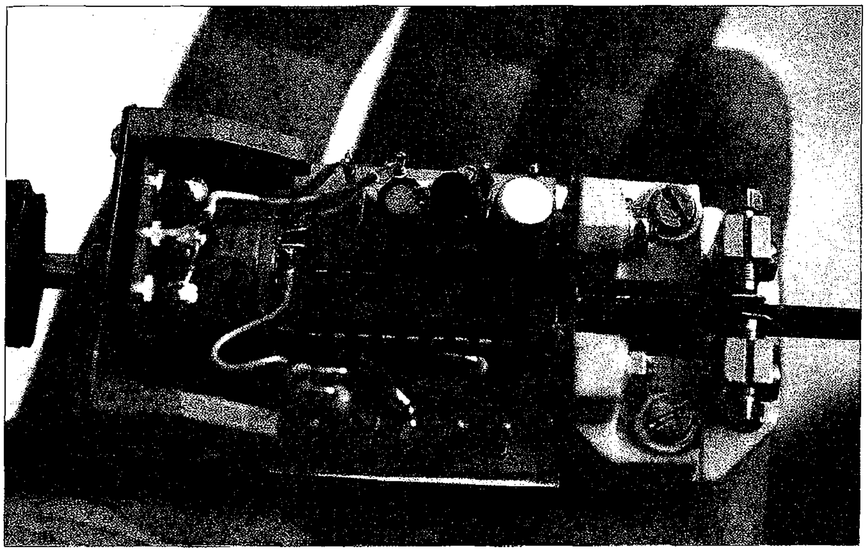

***Photo A.** PIC-based CW keyer.*

Y2K Portable J-Pole

What emergency will you need to handle?

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For 2-meter portable use, I like the idea of having a full-size roll-up antenna available for situations where communication necessity outweighs the compact convenience of the usual rubber-flex antenna. Sometimes, we need to "get out" better! Roll it up and an antenna like this will fit perfectly in your Y2K emergency preparedness kit!

The portable, flexible J-pole is not a new idea; I've seen several over the past decade or so and tried most of them—but with mixed results. They did radiate after a fashion, but VSWR was much higher than expected, and band coverage was narrow or the coax tap point for a decent match was very picky and difficult to move. While moderate VSWR can be tolerated by most handhelds, maximum power transfer always occurs when the source and load impedances are matched. Besides, high VSWR nags at me, even when overall results seem to be satisfactory.

The approach taken in this antenna is so old, it might be considered novel. I was browsing through an early radio book and noticed in a diagram that a half-wave Zeppelin antenna (the original J-pole) used link coupling between the transmitter and the quarter-wave matching section (which feeds the half-wave radiator). Aha! Link coupling ... I haven't seen that tried, so here it is! It gives full band coverage on 2 meters, with VSWR less than 1.3—very broad.

My first attempt at construction used ordinary hookup wire for the link and plastic tape to hold it in place at the shorted end of the matching section. It worked fine but, realizing the difficulty of describing how to do it, I decided to use a PC board to "freeze" this potentially critical portion of the antenna for easy duplication, convenience, and improved long-term stability (no tape to come unraveled!).

On the J-pole coupler PC board, the outermost U is actually the cold end of the quarter-wave matching section. Inside it is the link coupling loop and donut pads to mount the series tuning capacitor (3.5–20 pF, Mouser 24AA022 or equivalent). Pads are also provided to install a small fixed capacitor in parallel with the trimmer just in case the one you use is too small in value. The remaining small pad is for RG-58 (or equivalent) coax center conductor; the two larger pads nearby accept pigtails from the coax shield, one on each side of the coax. The two isolated pads are drilled out to provide holes for coax strain relief. Use a nylon tie-wrap or small magnet wire wrapped around the coax and through these holes to secure it to the PC board. Now your connections

Photo A. Y2K portable J-pole antenna, coiled up and ready to go.

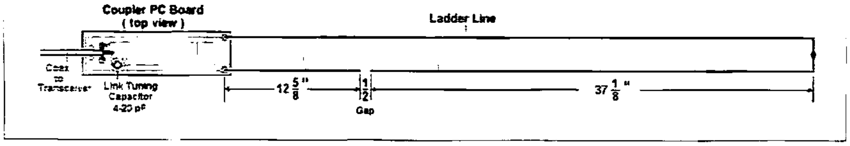

Fig. 1. Portable J-pole antenna for 2 meters.

are all secure, and nothing can move around or shift over time.

The coax cable may be any length you wish, fitted with a connector on the far end to mate with your transceiver. I chose a five-foot length with BNC connector for general use, but if you anticipate pulling this antenna up into a tree or some other support, use a longer piece of cable to gain that height advantage.

The remainder of the matching section and the half-wave radiator are fabricated from a single piece of plastic-covered ladderline, approximately 55 inches long. The type I used was a standard radio store item with conductors spaced 0.8 inches and roughly fifty percent dielectric fill in between, alternating between plastic spacers and air.

Measure 13 inches from one end of the line, and in the middle of the next spacer section beyond that point, make a 1/2-inch gap in one side of the line (the gap is placed in a spacer section so it won't weaken the structure as it would if you placed it in an air section). Now

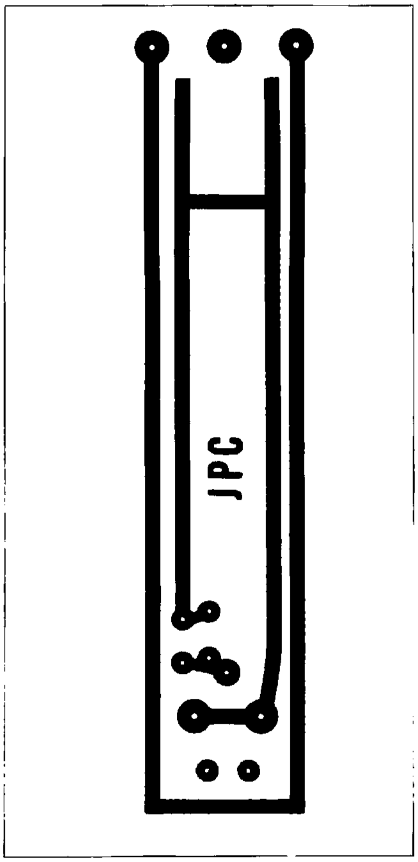

Fig. 2. Full-scale etching pattern.

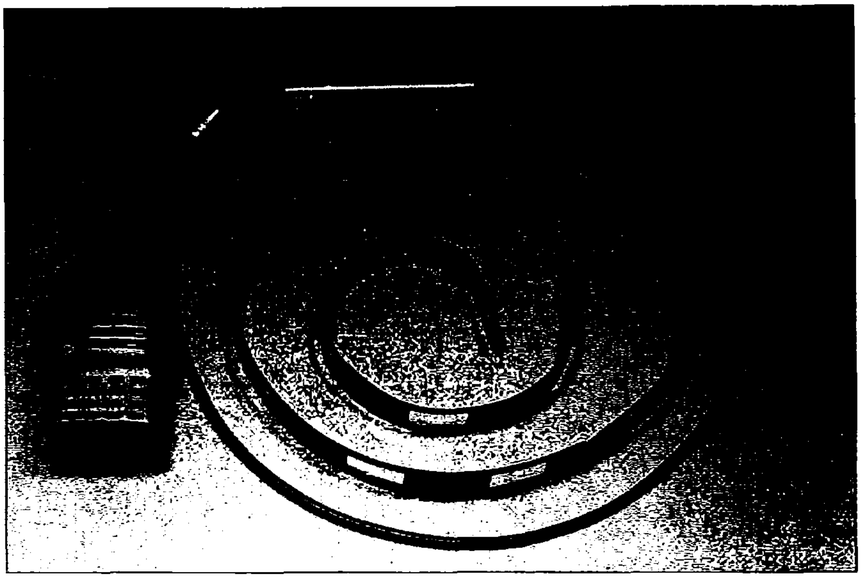

Photo B. Antenna detail.

measure 12-7/8 inches back toward the same end, cut the line, and remove 1/4 inch of insulation from each wire. Connect this end of the line to the large pads at the open end of the outer U on the coupler PC board. The distance between these pad connections and the beginning of the gap should be 12-5/8 inches.

From the other side of the gap, measure out 37-5/8 inches and cut the ladderline at that point. Remove 1/2 inch of insulation from each side of the line and bend the wires at right angles so that they touch each other. Solder them together. This makes the radiator just over 37 inches long, and connecting the two wires fattens it considerably for broadband performance. For suspending this antenna vertically, attach string, shoelace, or small rope of a length that will suit your needs.

With the antenna hanging in a clear area, adjust the link tuning capacitor for minimum VSWR while transmitting in the middle of the band. Reflected power should go down to zero or nearly so, and VSWR at the band edges should not rise much beyond 1.3 to 1 (at least that was the case in several units built and tested here).

Other types of parallel conductor transmission line, even TV twinlead, should work with this coupler PC board, but differences in propagation velocity will likely change the dimensions somewhat—especially the distance from the coupler to the gap—so you may have to experiment.

If you're tempted to push this antenna into a piece of PVC tubing (with end cap) for use as a fixed station antenna, it will work—but not with the dimensions given. For use inside a 1-inch-i.d. PVC tube with a wall thickness of 1/8 inch, you can make the coupler-to-gap distance 11-7/8 inches and shorten the radiator to 34-3/4 inches. Adjust the link tuning capacitor for best SWR with as much of the antenna as possible inserted in the tube, and then push in the rest.

The antenna can be supported within the tube by drilling the wall approximately 18 inches down from the top and inserting an insulative pin or small-diameter rod through one of the air sections of the ladderline. Seal the holes to keep the rain out. Keep in mind that this antenna was designed for typical handheld transceiver power levels. Though it showed no evidence of RF heating (in the trimmer capacitor) with a 10 watt transceiver, I doubt if it would handle a whole lot more than that. If your power needs are greater than the 10 watt level, I suggest you substitute a mica compression trimmer like the ARCO 401 if you can find one.

Continued on page 36

Defogging Microstrips

An intro to microstripline filters.

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This article describes microstipline filters. They perform the same functions as LC circuits but don't look anything like typical ones. I'll show you how to design and make your own. I retraced my steps as I was trying to develop one, so you wouldn't waste time and make the same mistakes I did. Let's try to remove some of the fog surrounding this topic.

I needed an input filter for a microwave downconverter that I built. It translates microwave frequencies to VHF. Without a filter at the RF input, the signal was noisy because the converter combined both the desired signal and the image noise in the output. I had seen microstripline filters in commercial equipment, but had no idea how to design them or how they worked. The filter I designed provides noise-free signals, whereas before the signal was covered with so much noise that it was useless.

These filters can be used in equipment for the 440, 902, and 1296 MHz ham bands and the 1691 MHz weather satellite band (my application). They are useful at higher frequencies if test equipment is available that can go higher.

Theory

Microstripline filters can consist of several grounded 1/4-wavelength-long sections of printed circuit track on double-sided PC board. See **Photos A** and **B**. The energy in one element is coupled into the next element due to their close proximity. They resonate at one frequency, just like a 1/4-wave antenna. The loss through the filter is determined by the spacing between the elements and the number of elements. The bandwidth decreases (gets sharper or narrower) as the spacing between elements is increased, and the loss

Continued on page 20

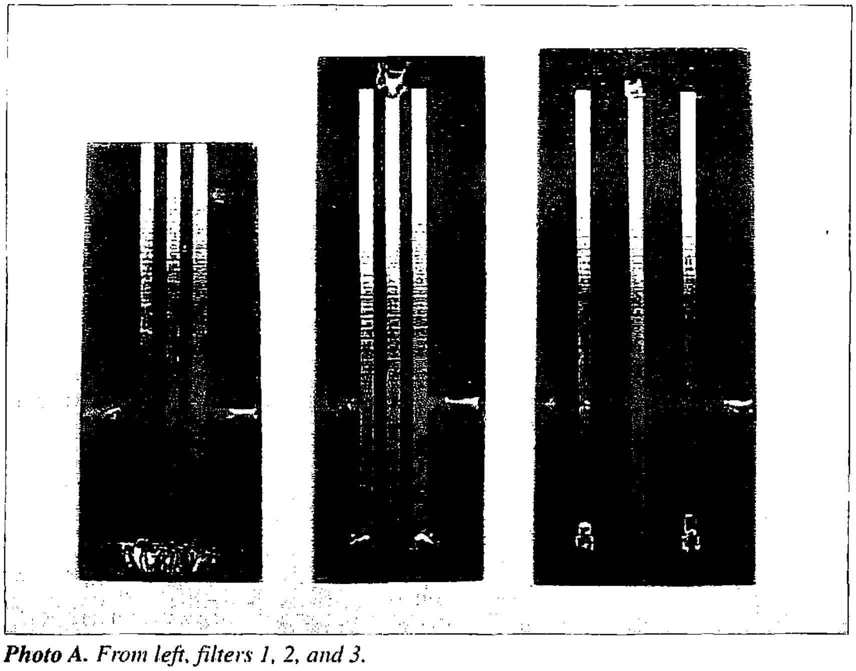

***Photo A.** From left, filters 1, 2, and 3.*

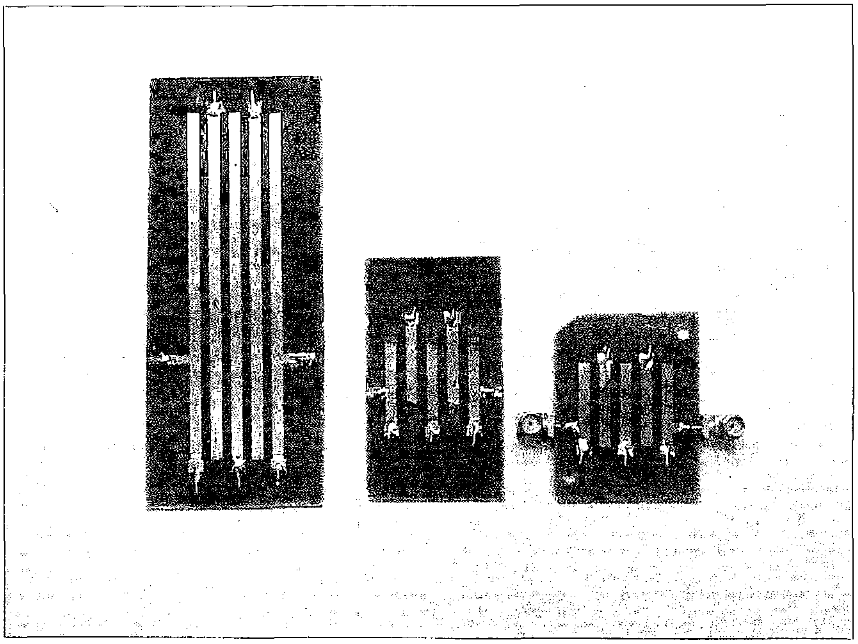

Photo B. From left, filters 4, 6 (filter 5 after trim), and 7.

Defogging Microstrips
continued from page 19

increases as the spacing is increased. (Compare **Figs. 3** and **4**.)

The amount of loss you can tolerate and the bandwidth you require determines the spacing. You can add more elements and get a sharper filter curve (steeper sides on the filter response; compare **Figs. 3** and **5**), but more board space is required. If you want lots of rejection far from the passband *and* a wide passband, you may have to stagger tune the elements, making each element resonate at a slightly different frequency. There is no one filter configuration (number of elements and spacing) that is correct for every application.

Since the 1/4-wave lines (we'll call them lines instead of PC tracks) are constructed above a ground plane, the board insulating material affects the velocity factor because it has a dielectric constant different from that of air. This makes the lines shorter than they would be if the dielectric was air.

In this article, I'll discuss two configurations of microstripline filters: comb and interdigital. In a comb configuration, all the lines are grounded at the same end. In an interdigital configuration, the grounded ends alternate. I obtained greater loss with a comb configuration. The graphs discussed later will demonstrate this higher loss.

There is a third type of configuration that I did not try. It uses 1/4-wave lines grounded at the input/output and 1/2-wave floating lines for the intermediate lines. See **Fig. 1**. I don't know whether this type has other desirable characteristics. See Ref. 3 for further details.

The actual lines should be 50 ohms impedance, because that provides a good match to other devices (the LNA, mixer, etc.). The input and output track should also be 50 ohms impedance. For 0.062-inch glass epoxy board, a 50 ohm line is 0.100-inch wide. The 50 ohms is determined by the line width and the type and thickness of substrate. A good article on determining the impedance of various thicknesses, substrates, and line widths was referenced by many other articles. See Ref. 1. To obtain the desired 50 ohm impedance, the input and output taps should be about 1/3 of the way up from the ground end.

Development and design

The first thing I always do when starting a new concept is to go over all my old issues of *73 Magazine, Ham Radio, QST,* and the *ARRL Handbooks.* I also get *RF Design* at work and keep a file of articles that I think I might need in the future. After spending many hours searching for information on microstripline filters, I found one brief article in *Ham Radio* (Ref. 1), one page in the *ARRL UHF and Micro-*

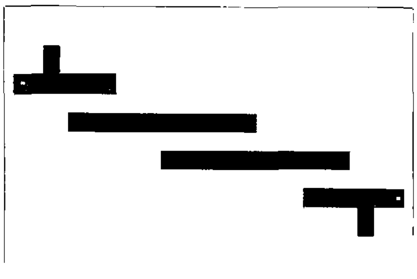

Fig. 1. Typical PC board artwork for "floating 1/2-wave" design.

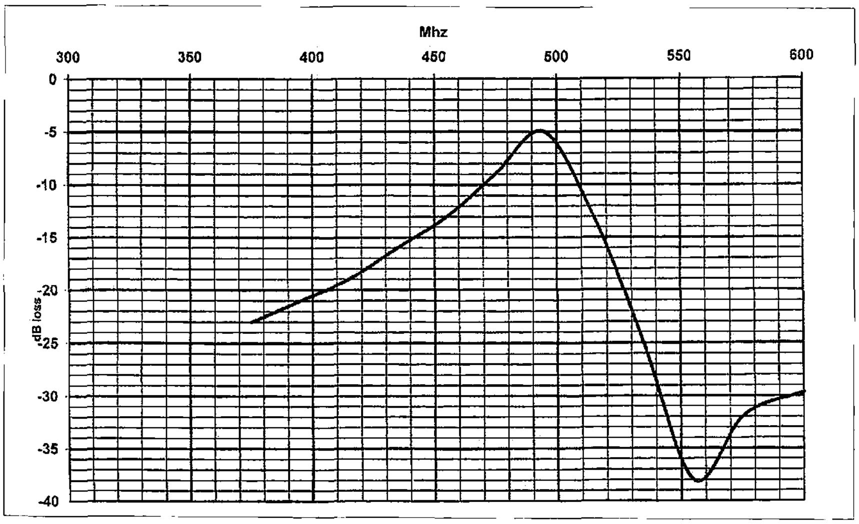

Fig. 2. Frequency response curve of filter 1, 3-pole, .100" spacing, comb configuration.

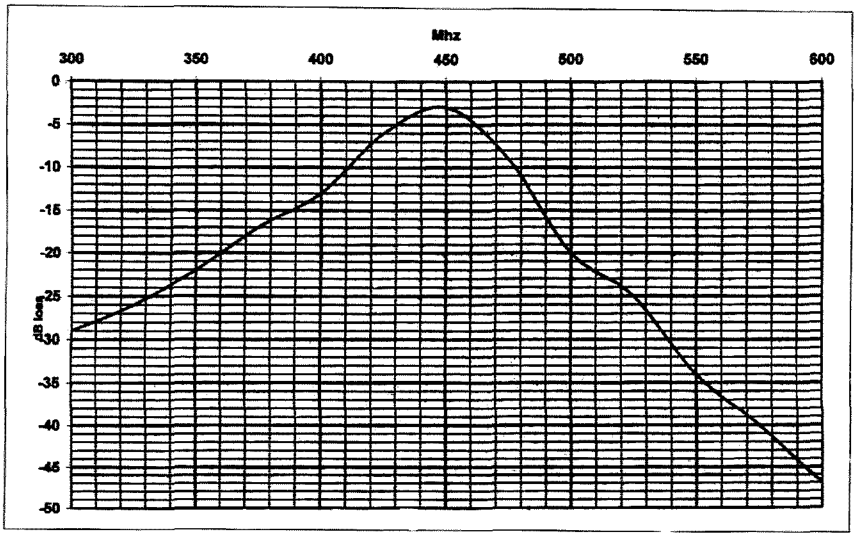

Fig. 3. Frequency response curve of filter 2, 3-pole, .100" spacing, interdigital configuration.

wave Experimenters Handbook (Ref. 2), two *very* technical articles in *RF Design* (Refs. 3 and 4), and some technical correspondence I had with Chuck Houghton WB6IGP about 7 years ago (he does the excellent Above and Beyond column in *73 Magazine*). One *RF Design* article didn't really explain how the filters function but was just a computer program you could purchase or enter yourself. The other *RF Design* article discussed a lot of theory I didn't understand. The *Ham Radio* magazine article showed a little of what I was looking for; it described 2- and 3-element filters and demonstrated that 3 elements produce a sharper filter than one with 2 elements. *The ARRL UHF and Microwave Experimenters Handbook* listed an example of a filter but didn't provide much design information. The best guidelines I was able to obtain came from Chuck Houghton. He sketched out some notes in answer to questions I posed and said I would have to experiment with the design. The handwriting was on the wall! It was time to stop reading and start making some filters!

Where I work, we use DOX (Design of Experiment) and Taguchi methods wherein we vary one (or more) parameter(s) at a time to see the effects of each change on a given design. Using these techniques to develop the required filter, I would have to vary the

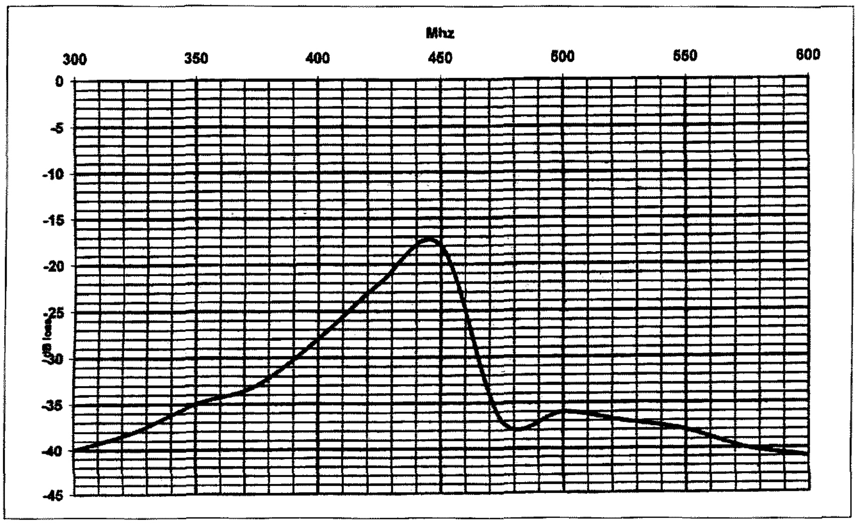

Fig. 4. Frequency response curve of filter 3, 3-pole, 5/16" spacing, interdigital configuration.

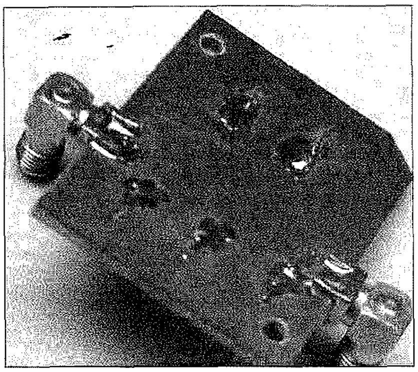

Photo C. *Bottom view of SMA connectors.*

spacing, try both interdigital and comb configurations, and vary the number of elements until I obtained the desired bandwidth and loss.

I began by building a filter that I could easily test and analyze with our commercial generator. Both the frequency and level can be set accurately. The first filter I built resonated at around 450 MHz, well within the range of both the spectrum analyzer and the commercial signal generator. I plotted the data showing the performance of each filter after it was built. I made more filters that had different spacing, a different configuration, and a different number of elements. Plots of filter performance vs. filter type are shown in **Figs. 2** through **8**. See also **Photos A, B,** and **C**.

Figs. 2 and **3** show the difference between comb and interdigital configurations. Comb filters have about 3 dB more loss than interdigital filters for a given spacing and number of elements. In **Fig. 4** the lines were placed farther apart. Note that the loss at the pass frequency is very high (-17 dB). In **Fig. 5** the number of elements was increased from 3 to 5. This change provided steeper sides, indicating more attenuation of undesired frequencies.

Fig. 6 shows a filter that has the proper spacing. It's an interdigital configuration and was purposely made too long so that it could be trimmed to resonate at the desired frequency (1691 MHz). After trimming, notice in **Photo B(b)** that the elements are no longer fully engaged. This showed up as more attenuation than I thought should be present (-10 dB), although the curve had the correct shape.

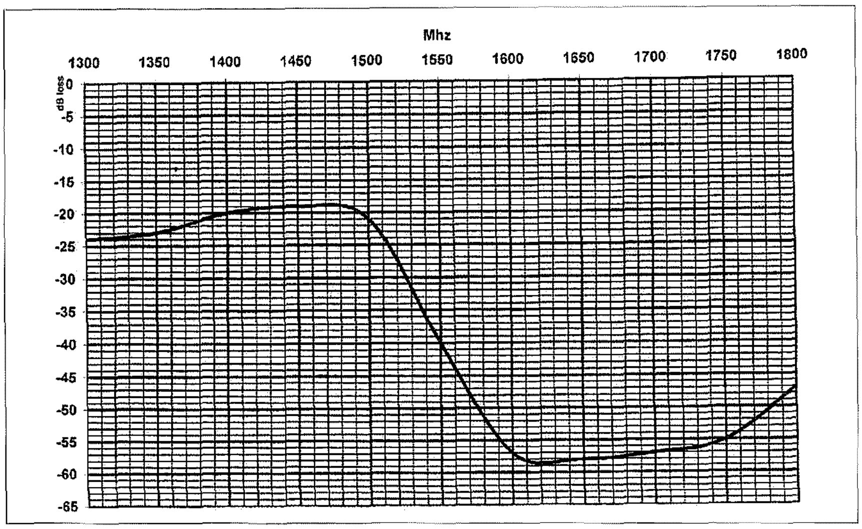

Fig. 6. *Frequency response curve of filter 5, 5-pole, .100" spacing, interdigital configuration.*

The only change to be made at this point was to change **Fig. 7** so that the elements were more fully engaged with the correct length. The finished filter performance is shown in **Fig. 8**. While the final design does have more loss than I thought my receiver could tolerate, it actually worked fine as-is for my application. Later I'll discuss how to reduce the loss of the filter. If you must change the length of a filter element a significant amount to get it exactly on frequency, don't forget to move the input and output lines to 1/3 the distance from the ground end. This will retain the 50 ohm input/output impedances.

Filter line lengths for the frequencies I tested are as follows: 450 MHz—3.625 inches; 1400 MHz—1.00 inch; and 1691 MHz—0.85 inches.

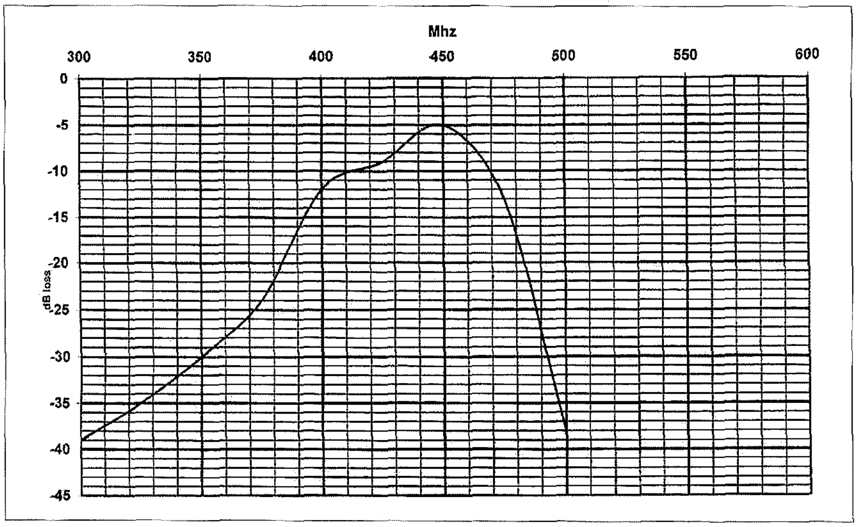

Fig. 5. *Frequency response curve of filter 4, 5-pole, .100" spacing, interdigital configuration.*

Making the filters

To compose the filter artwork I used the Paintbrush software that comes with Windows 3.1, Win95, and Win NT. You will have to turn on the coordinates (X,Y) to provide information on the position and dimensions of the filter elements. Use zoom so you can see each grid square. You should also have the gridlines turned on. This software will give you 0.01-inch resolution, which is adequate for this type of filter work and most other PC artwork you may need.

Select black for the color, then begin clicking along the outline of the track you need. After this use "fill" (the icon

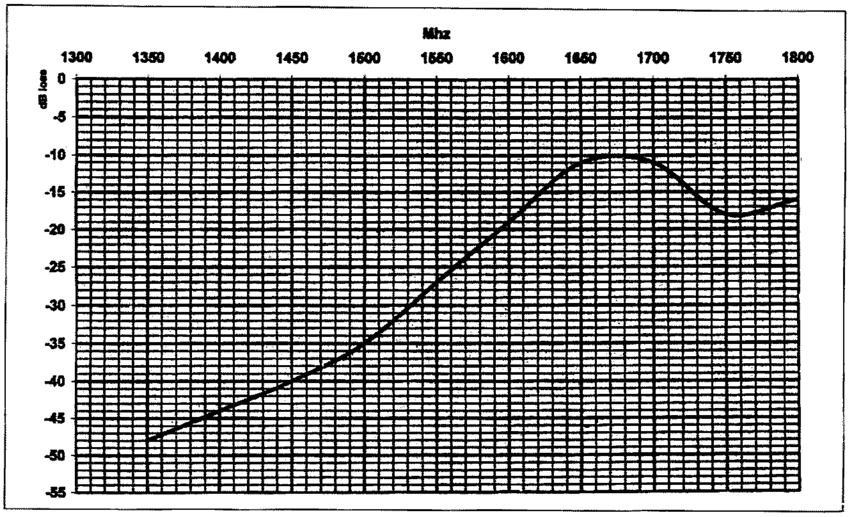

Fig. 7. Frequency response curve of filter 6; this is filter 5 trimmed to peak at 1691 MHz.

looks like paint being poured from a can) to complete that section of track. Make sure the outline is solid, or else the entire image will be filled in. (Use "undo" if you missed a grid square.) You should start near one corner, working out from that corner toward the center of the work area. The software provides a 6.4" x 4.8" working area. I recommend starting at an even-numbered grid square, say 100,100. That way you can make the track width the required 0.100 inches.

The spacing will be what you determine to be best for your application, and the length will be what you need. Note the difference between the coordinates of the upper left and lower right of a given track, and that will give you track width and length. For example, assume the upper left is 100,100 and the lower right is 300,110. Subtracting the first point from the second, you can determine that the track is 2 inches long and 0.100 inches wide. I recommend putting a single line "test pattern" near the edge of your board (away from the filter elements) that is exactly 1 inch long and has a short perpendicular line at each end. This test pattern is shown in **Fig. 9**. If this line is exactly 1 inch long on your printed artwork then the rest of the artwork is accurate. If not, then the rest of your artwork is wrong. Verify that you have the scaling set to 100%.

I used Press-n-Peel to transfer the artwork to double-sided board. This product is very easy to use. It requires that you have a laser printer to print the track image on their special media. See Ref. 5. (I've used Press-n-Peel to make these filters and several other boards and only had problems the first time.)

After printing the track onto the special media, use a common clothing iron to transfer it to double-sided copperclad board. I've used both the paper-based and the blue plastic film

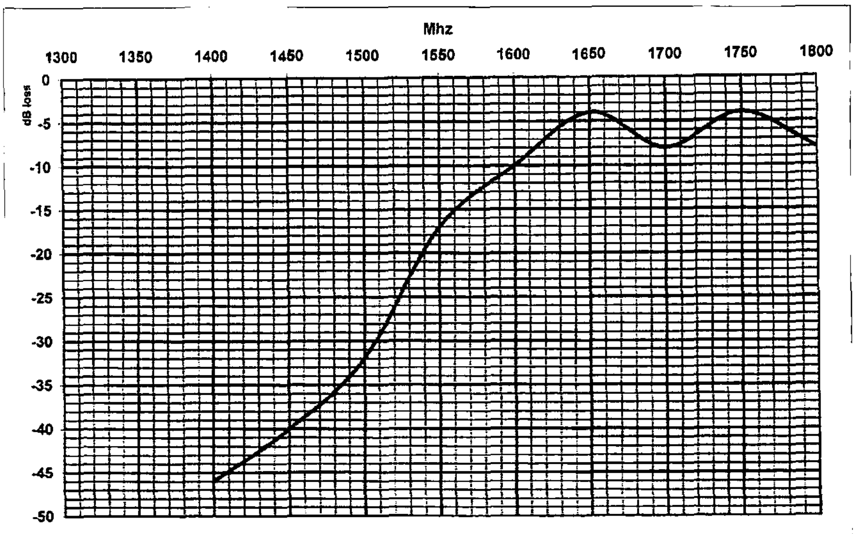

Fig. 8. Frequency response curve of filter 7. 5-pole, .100" spacing, interdigital configuration.

types. and prefer the latter. I use Scotch/3M Super 33+ electrical tape as a resist for the ground plane. Handle the board very carefully when attaching the tape. The track resist on the filter side can come off if you scratch it too hard. I used etchant from Radio Shack that I heated with a 100 watt spotlight held about 6 inches above a small plastic tray. Please *don't* pour the used etchant down the drain! It will eat metal (it ate the copper from your board, right?), so must be discarded properly at a hazardous material handling station.

To ground the one end of each filter element, I drilled a small hole (0.044-inch-diameter), pushed a small wire through, bent the wire over on both sides, and soldered it on both sides. Make sure that you are drilling all holes the same distance from the ungrounded end, or else the lines will be a different physical and electrical length, thus spoiling the shape and performance of the filter.

I don't know how close the end of each element can get to the edge of the board before filter performance starts to suffer. I used a minimum 1/2 inch spacing all around the board.

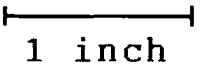

Fig. 9. Printer scaling test pattern.

Testing the filters

Connect your signal generator to the spectrum analyzer and adjust the level of the generator (if yours is adjustable) until the display reads nearly full scale so you can use the full range of the analyzer. Then insert the filter to be tested in line between the analyzer and generator. Vary the frequency from the lowest to the highest frequency of interest. The lowest should be well below the "image" frequency of your converter if you are building a lowside injection converter.

The range over which you test the filter should include all frequencies you want to reject and pass. In my case, I wanted to pass 1691 MHz and reject 1416 MHz, since 1416 MHz is the "image" of 1691 MHz. The image frequency is two times the IF lower than the frequency you want to receive. [My IF is 137.5 MHz; 1691 - (2 x 137.5) = 1416.] Plot the frequency vs. level output every 25 MHz (more or less, depending upon what kind of resolution you need on your filter's performance).

Note that the level without the filter in line is the starting level. All the data points with the filter in line are below the starting level (negative dB). The filter ideally would have no loss (0 dB) at the center frequency and lots of loss (-40 dB or more) away from the center frequency. Plot the data points you took using axis scales as shown in **Figs. 2–8.** The plots shown here were made using Excel software and data I recorded manually.

The HP generator I used only goes up to 1100 MHz. I needed a filter that operates at 1691 MHz, and I needed to test it well above 1691 MHz. To test above 1100 MHz, I used a POS-2000 VCO from Mini-Circuits (Ref. 6). The VCO costs $20 (plus handling/shipping) and covers 1300 MHz to 2000 MHz with about 15 milliwatts output power. They make very good, rugged VCOs. They are all 50 ohm output impedance and cover frequencies from 10 MHz to 2000 MHz. Obtain the data sheet that covers the unit you use. They are tuned over the range with a pot as shown in **Fig. 10.**

You'll also need to design a simple circuit board for this "generator." The VCO's pins are all on 0.100" centers, so the layout is very simple. I recommend getting a copy of their *RF/IF Designers Handbook* and *VCO Designers Handbook.* See Ref. 6. They have extensive and very useful theory and practical design and construction information on various types of microwave components.

I used SMA-type connectors to couple signals in and out of the filters. I bought used ones at a hamfest for $1 each. New ones cost $10. They mount on the edge of the board as shown in **Photos C and D.**

Summary and other changes

As you can see, I built a lot of filters. By keeping characteristics that helped performance (0.100-inch instead of 5/16" spacing, using an interdigital instead of comb configuration) and discarding ones that hurt performance, I was able to get close to the desired bandwidth and loss.

You will need access to a spectrum analyzer and a VCO at a minimum. If you don't own an analyzer, perhaps a broadcast engineer at a local TV/FM station (hopefully a ham) can let you use theirs. The VCO is adequate for the home experimenter. Of course, a generator is easier to use.

These filters are not made for transmitting applications. I don't know how much power they can handle, since my application was for receiving. I didn't have any equipment to measure SWR.

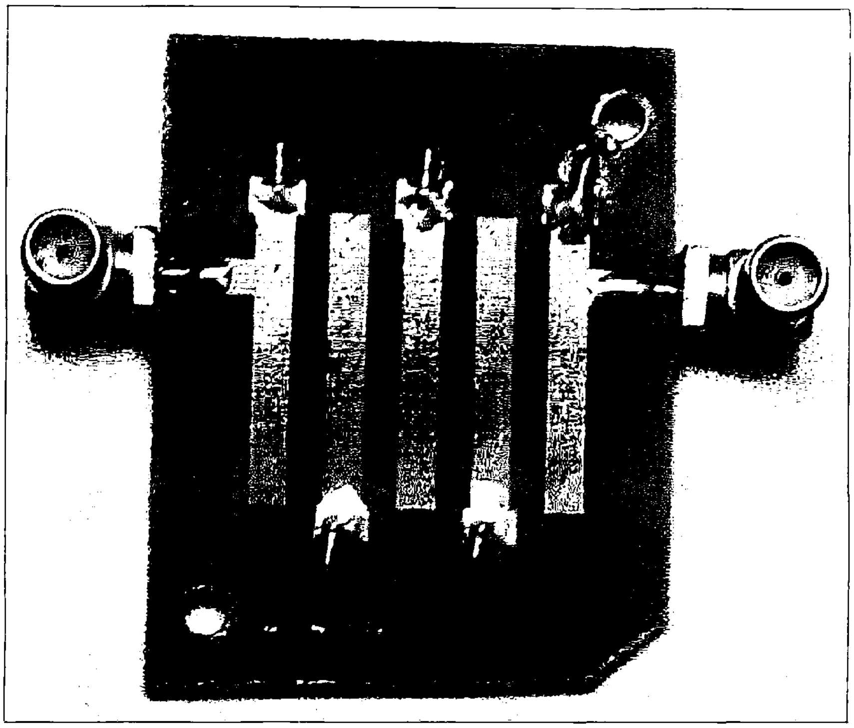

Photo D. Top view of SMA connectors.

so I couldn't determine the input and output impedances. They may be slightly different from 50 ohms and may be reactive (capacitive or inductive).

Tuning capacitors can be added at the ungrounded end of each line in the filter to allow the center frequency and passband to be varied or if you want to tune the filter exactly on the desired frequency. If you want to experiment with this feature, make sure you use high quality piston-type capacitors. Be aware that they are not cheap! I bought some at a hamfest just in case I needed them. They were $5 each. That's $25 for a five-element filter! I prefer to make the passband a little wider than I really need—This ensures that the frequency you want to pass unattenuated will be in the passband. At the higher frequencies (over 1000 MHz), only a few picofarads of capacitance is needed to move the frequency of each line many megahertz. To increase the bandwidth by a large amount, the lines should be stagger tuned (each line is tuned to a different frequency so the overall response is a summation of the individual responses). This requires a tracking sweep generator that allows you to get an instant picture of the filter's response curve. I understand that tracking sweep generators are quite rare, so if you have access to one, consider yourself very lucky! The alternative is to use your existing setup and plot the results of each tuning adjustment you make. Obviously, this requires infinite patience and good data taking/analysis skills.

The cost of materials is very low. Double-sided 0.062" glass epoxy circuit board is available at larger hamfests. The Press-n-Peel is the most expensive item you'll have to buy. It runs around $1 for an 8-1/2 x 11 sheet. If you want to be real cheap (okay, conservative!), you can use part of a sheet of the Press-n-Peel taped to a full-sized sheet of regular printer paper. Run a test on regular paper to see where to tape the Press-n-Peel. Put this "carrier" paper in the printer paper bin and print your artwork.

I enjoyed making the filters, analyzing the data, and learning how each variable affected filter performance. If you decide to try the techniques described here, please write me and let me know how you did. I would enjoy hearing from you and am willing to provide help and share all my notes. Please send an SASE (thanks!)—I'll cover all the copying costs.

Many thanks to my wife Yvonne for proofreading the text of this article.

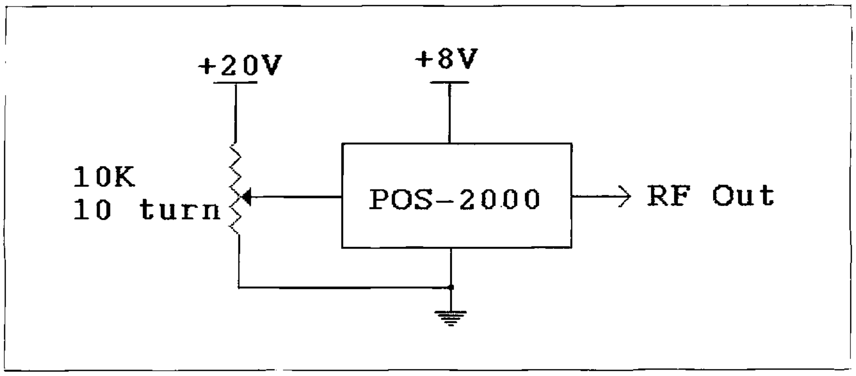

Fig. 10. VCO schematic.

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1. *Ham Radio Magazine*, Dec. 1975, pages 46–49.
2. *ARRL Microwave & UHF Experimenters Handbook*, pages 8-31 and 8-32.
3. *RF Design*, Aug. 1995, pages 95–102, "Filter Synthesis & Analysis Program," software listing in article.
4. *RF Design*, Mar. 1989, pages 56–57, "A Parallel-Coupled Resonator Filter Program," software is $25.
5. Press-n-Peel is available from Techniks, Inc., P.O. Box 463, Ringoes NJ 08851; (908) 788-8249.
6. Mini-Circuits, P.O. Box 350166, Brooklyn NY 11235-0003; (718) 934-4500; [www.minicircuits.com].

Secrets of Transmission Lines

Part 2: Review of AC fundamentals.

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The original dynamo was an AC rather than a DC machine. However, alternating current seemed to be significantly less useful than direct current. One cannot charge a battery, conduct electrolysis, or electroplate with alternating current. Arc lights operate poorly on AC and welding is rendered more difficult. Furthermore, the behavior of circuits excited with alternating current was profoundly more difficult for investigators in the early 1800s to understand.

Probably the most puzzling item was the fact that Kirchhoff's Law was not obeyed.

In the circuit similar to Fig. 3 of Part 1 and equation 1-6, the value of i was not necessarily equal to the sum of $i_1 + i_2 + \ldots i_n$; in fact, it was usually smaller. In a series circuit, E was not necessarily equal to $E_1 + E_2 \ldots + En$; in fact, it was usually smaller, too. In addition, current would seem to flow in circuits where there was no connection. It is not hard to imagine that it would take a considerable amount of investigation to explain this behavior.

In 1820, Hans Christian Oersted found that an electric current flowing in a wire would deflect a compass. In the same year, François Arago found that a helical coil of copper wire, otherwise nonmagnetic, would behave identically to a bar magnet when an electric current flowed through it. This work attracted the attention of André-Marie Ampère, who showed that there is a physical attraction between wires carrying currents flowing in the same direction and a repulsion between wire carrying currents in opposite directions. This is very easy to prove experimentally. The apparatus of **Fig. 1** is easily made from a couple of screw eyes and a length of stiff copper wire. The stronger the current, the farther the bail will swing out.

Note that the battery polarity can be reversed without changing the result, since the current in both the stationary loop and the bail are reversed. A small transformer with a lamp in series to limit the current can be substituted for the battery and will also do the same thing. The angle of the bail will be proportional to the absolute value of the average current. By absolute value we mean without regard to algebraic sign. If the algebraic sign is included, of course, the average current is zero since you have as many positive as negative cycles.

Electromagnetic induction

In 1829, Joseph Henry wound a layer of insulated wire on a U-shaped iron core and found that it made a very powerful magnet when energized. The illustration in **Fig. 2** shows the electromagnet with a significant addition. Henry found that when the switch was closed, there was little or no sparking; however, when the switch was opened, there was a large and vigorous spark—much more energetic than could be obtained from the battery alone. In 1831, Michael Faraday found that a second winding not electrically connected to the first would show an electrical impulse when the battery was first connected and also when the circuit was opened. This is termed electromagnetic induction. A changing current in the primary circuit induces a voltage in the secondary

To duplicate the experiment, it is not necessary to wind a lot of wire, although this could be done using a large iron nail. Small, cheap transformers (for example, 12 V, 300 mA output) are often made with the "E" and "I" core pieces not interleaved. If you pry open the metal frame, the "I" will fall off in one piece. With a single D cell,

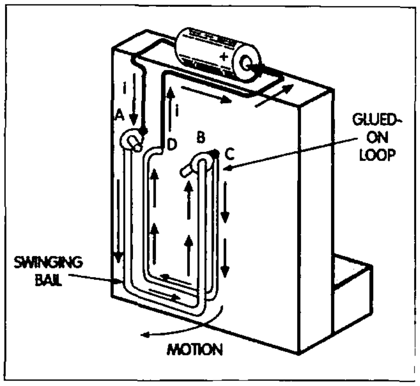

Fig. 1. When the circuit is closed, a "D" cell will drive about an ampere through the circuit and the bail will kick out sharply.

you can investigate the magnet properties and the primary sparking. With an analog voltmeter on the other winding, you can investigate the induction. The analog meter is specified because it shows transient voltages better. You can see how far the needle kicks, whereas a digital meter just flashes digits too fast to follow.

You really do not need a switch. You can open and close the circuit just by touching the wire to the battery. However, if you are holding both sides of the circuit when you break it, you can get a rousing shock even with just the 1.5 volt battery. The spark voltage is many times higher. We will get back to this shortly.

Capacitance

Another property to be investigated is capacitance. When people were working with static electricity, a standard device used was the "condenser" or Leyden jar. The Leyden jar was a glass jar with foil on the outside and the inside with no electrical connection between them. There was usually an insulating cork with a rod sticking through that contacted the inside foil. With an electrostatic generator you could "charge up" the jar—and the spark that ensued when it was discharged was much more vigorous than what could be obtained from the electrostatic generator alone.

As an experiment, take a 9-volt transistor battery, an analog voltmeter with a 10 or 12 volt scale, and an electrolytic capacitor with a 1000 or 2000 μF rating (of course, with a 9 or more volt rating). Touch one of the capacitor leads to the battery, and connect the other to the battery through the voltmeter, observing polarity. The voltmeter will initially jump to a 9 volt reading (it may even overshoot a bit) and then the voltage reading will taper off, eventually winding up at zero. The capacitor is now charged, and its voltage is equal to the battery voltage so the voltmeter reads zero.

Short the capacitor with something, and you will see a substantial spark. If you short the capacitor on a piece of printed circuit board, it may even blow a hole in the foil. Note that shorting the battery itself will not make a visible spark. The capacitor stored energy from the battery over a period of time and released it in a much shorter period—therefore the vigorous spark.

Stored energy

In both the inductor and the capacitor, the energy is taken up relatively slowly and the spark is evidence of the sudden release of the stored energy. In the inductor, the energy is stored in building the magnetic field. This is a form of kinetic energy and quite analogous to the action of a hammer. You store energy of motion swinging the hammer, and the hammer imparts the energy to a nail in the few milliseconds that it takes for the nail to stop the hammer head. The energy stored in the inductor is:

Continued on page 28

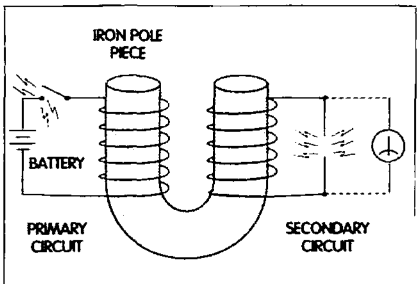

Fig. 2. The electromagnet and electromagnetic induction. When the current is established in the primary circuit, energy is stored in the magnetic field. When the current is interrupted, this energy is dissipated in the form of one or more arcs.

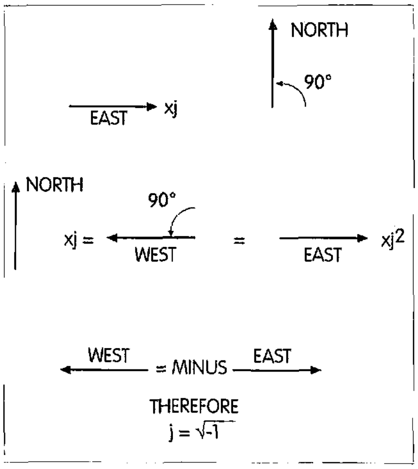

Fig. 3. The imaginary operator "j".

Secrets of Transmission Lines
continued from page 27

W = (L*i²)/2 joules or watt seconds
eqn (2-1)

where
L is inductance in henrys
i is current in amperes

If the inductance had been large enough and you measured the current when the connection was first made, you would see that the current started at zero and built up slowly. The rate at which the current builds is:

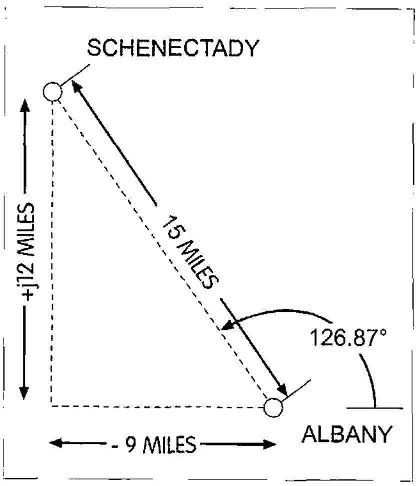

Fig. 4. The vector distance from Albany to Schenectady. If we define the plus direction as east and the +j direction as north, then the minus direction is west and the -j direction is south. The path, or vector distance, is -9 + j12 miles, or 15/126.87° miles.

d_i/d_t = E/L amperes per second
(2-2)
where
E = volts
L is inductance in henrys

On the other hand, the energy stored in the capacitor is potential energy. It is analogous to the energy stored in a spring when it is compressed or stretched. The energy in the capacitor is:

W = (C*E²)/2 joules
(2-3)

where
C is capacitance in farads

The voltage across the capacitor is given by:

E = Q/C volts
(2-4)

where
Q = charge in coulombs

but Q is equal to the integral of i*d_t.

A little AC math

In order to go through some of the subsequent explanations, it becomes necessary to resort to some vector algebra, which sounds a little more frightening than it actually is. Suppose that you tell the air traffic controller that you are departing at 200 mph. You haven't told him where to find you. At the end of an hour you could be anywhere on a circle of 200 mile radius. However, if you tell him that you are departing at 200 mph on a course of 90 degrees, he will know that at the end of an hour he will find you at a point 200 miles to the east.

The latter is a *vector* quantity. You know where it starts, how fast it is going, and in which direction. Quantities that have no direction—such as dollars, watts, temperature, and population—are called *scalars*.

One of the first things we have to find out about is the "imaginary" operator "j". Suppose that we wish to assign an operator that will rotate a vector 90 degrees in a counterclockwise direction. Referring to **Fig. 3**, let us assume that we have a vector one unit long pointing east. If we apply the operator "j" once, the vector is now north. Applying the operator a second time leaves the vector west. But west is equal to minus east. Therefore, j*j or j² is equal to a minus one and j = $\sqrt{-1}$ — and there is no such number!

Charles Proteus Steinmetz worked in the General Electric laboratories in Schenectady, New York. He was fond of saying that there is nothing more imaginary about imaginary numbers than there was about the distance between Albany and Schenectady.

Referring to **Fig. 4**, and defining + as east and +j as north, we see that we could describe the distance as -9 + j12 miles.

Further, using the Pythagorean theorem we can compute the straight-line distance as:

dist = $\sqrt{[(9*9)+(12*12)]}$ = 15 miles
and
angle = 180 - arctan (12/9) = 180 - 53.13 = 126.87 degrees

The first of these descriptions is in rectangular or Cartesian coordinates and the second with a length and an angle is in polar coordinates. When vectors have to be added or subtracted, they are most easily done in rectangular coordinates. Vector multiplication and division are most easily done in polar coordinates.

Another useful relationship is Euler's equation. When we describe a vector such as the one above as 15 miles/126.87 degrees we see that this is really a shorthand way of describing Euler's equation as shown in **Fig. 5**. Euler's equation is a way of transforming between coordinate systems.

Back to components

Now let us consider some AC cases. Our instantaneous AC voltage is described as:

V = V_0*sin(w*t) volts
(2-8)

where

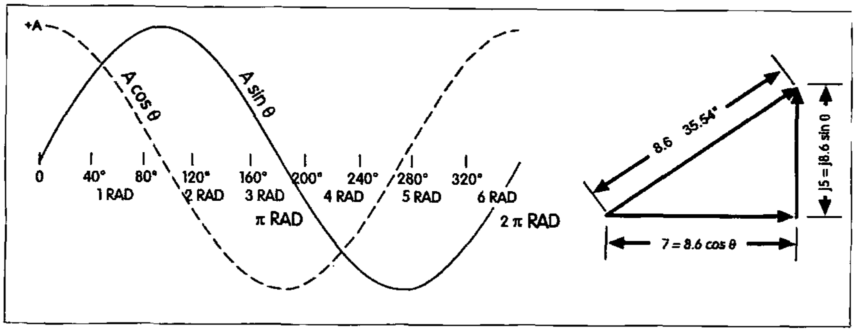

Fig. 5. Euler's equation. The symbol e represents the natural logarithm base, 2.718. The term $Ae^{j\theta}$ describes the location of the tip of a vector of length A rotated through an angle θ.
(2-5) $Ae^{j\theta} = A\cos\theta + jA\cos\theta$
(2-6) $Ae^{-j\theta} = A\cos\theta - jA\cos\theta$
(2-7) $8.6\angle 35.54° = 8.6^{ej35.4°}$

V_0 is the peak AC voltage
w is angular frequency 2*p*f in radians per second
f is cycles per second, or hertz
t is time in seconds

Note that we could have written this:

$V = V_0 * e^{jwt}$
(2-9)

And for the inductor, we noted in eqn (2-2) that:

$d_i/d_t = E/L$

and, rearranging,
$V = L*(d_i/d_t)$
(2-10)

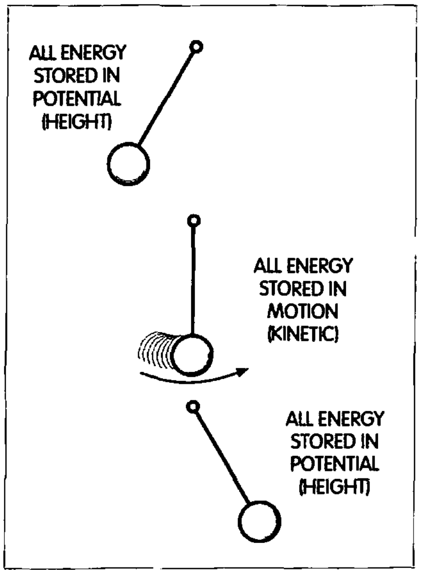

Fig. 6. The pendulum.

Note here that we have substituted the instantaneous voltage, and from (2-8):

$V_0 * \sin(wt) = L*(d_i/d_t)$

and, rearranging,

$d_i = (V_0/L) * \sin(w*t) * d_t$

Integrating gives

$i = -[V_0/(w*L)] * \cos(w*t) + \text{constant}$
(2-11)

The constant can be neglected because it pertains to transient conditions and we are concerned only with steady-state conditions here.

Now, from the curves of **Fig. 5**, we see that:

$-V_0 * \cos(w*t) = V_0 * \sin[(w*t) - 90]$
(2-12)

Thus,

$i = [V_0/(w*L)] * \sin[(w*t) - 90]$
(2-13)

What this tells us is that the inductor current lags the applied voltage by 90 degrees. In most AC problems we are interested in the average results over many cycles, and so we carry the (w*t) term implicitly and simply neglect to write it down. Also, we learned that the operator "j" would rotate the vector by 90 degrees. Making use of both of these conventions, we may rewrite (2-13) as:

Continued on page 36

Getting Your Foot in the Public Service Door

Here's how to get your club involved — and appreciated.

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The January 1999 issue of *Law & Order* magazine contained an article describing the benefits to local police departments of operations with amateur radio clubs and their members. The circulation of this magazine is about 38,000, mainly to police chiefs and supervisors. January is dedicated to communications subjects, and amateurs are definitely communicators.

Yes, amateur radio operators are communicators. In fact, it's our specialty. Now is the time for local amateurs and amateur clubs to approach local police departments and other supervisory personnel about joint operations for special occasions. The occasion can be a parade, a school function such as a basketball or football game, or a county fair. Anywhere large crowds gather offers an opportunity for amateur radio operators to show local police departments how they can help conserve manpower. Police chiefs are interested in conserving manpower because it directly affects their department's budget.

During special events such as Halloween, parades, or school functions, all police departments are short-handed. Any free help will be gratefully accepted.

The hardest part is getting your first assignment. Police departments are political in nature and guard their turf vigorously. Explain to your local chief just what you or your club can do for their department. During school events, police officers are usually assigned to the activity. Those officers can't be everywhere. How many times have you heard of someone's car being broken into while the owner was in the gym watching the basketball game? It happens.

Just remember one thing. You are not police officers and have no police powers. You are communicators. Your group can patrol the parking areas to discourage anyone from breaking into parked vehicles. This activity not only provides a more secure area, but also frees up officers for more important duties such as answering emergency calls.

Designate one club member to be your local dispatcher with access to the communications center of the police department. Your group uses amateur frequencies to report any suspicious activity and the investigation is assigned to a uniformed officer. You've done your job. You've reported what you have observed and you haven't tied up police frequencies that are probably monitored by the vandals and crooks.

After one or two successful joint operations, it will be a snap to expand your service into other areas of public safety.

Local emergency management agencies need people trained in communications when disasters strike. It might be the devastation of a flood, a tornado, or a toxic spill. Emergency management agencies need manpower to access damage reports or to notify people in areas of danger during a toxic spill. Amateur radio operators can provide a valuable service to these agencies, thereby freeing up police officers and other emergency personnel for more important jobs in protecting lives and property.

The jobs are out there. It is our job to cultivate the opportunities that present themselves. It takes time. Management personnel need to meet your club members. They must convince themselves that you and your club members are responsible and can handle the job.

As your club gains the confidence of your local agencies, other agencies

will be easier to approach with your ideas. You can use local department heads and supervisors as references. Once a local department has used your club for activities, other department heads will be more acceptable to joint ventures.

I must stress the importance of inviting your local chief or department head to your club meeting. Good relations with local government officials are your club's responsibility. Ask the chief to speak to your club members. He will be the key to a successful joint operation.

After an operation has been agreed upon, you must do what the chief or department head wants done in a professional manner—and no more. The one thing that chiefs fear is that a club member will get hurt, or show the department in a bad light. This kind of activity can devastate your club's relationship with a department. It will guarantee that you will not be asked to perform any other public services. In these kinds of operations, one bad apple spoils the rest.

Ask the chief, department head, or supervisor to provide training to club members before your planned activity. It will provide your club members valuable insight as to how that department wants the operations conducted and the department will be better satisfied that club members can handle the job.

After the operation, make sure you meet with the department head or chief to see if anything was done wrong. It will let the chief know that your club members are really trying to satisfy the requirements of the department.

Amateur radio operations in the name of public service to your local community are a bedrock of what our hobby is all about. It is the "service" in Amateur Radio Service. With more and more demand being placed upon our frequency spectrum, we *must* show that we as license holders are providing a valuable service to our local communities. This is one way of proving our worth.

Many amateur radio operators are also trained weather spotters for the United States Weather Service. Even Doppler radar cannot see what the human eyeball sees. They provide information to meteorologists when conditions are present for the formation of severe weather. Weather spotters help make it possible for the weather service to issue warnings to people in the affected areas.

For the past several years, our local amateur radio club has participated with the local police department at Halloween. On many Halloween nights, our club members have driven around the city with very little to report. In the past we have reported fires, drivers driving in an erratic manner, and acts of vandalism. On those nights where there was very little to report, you must keep in mind that someone might be watching you and you may have kept them from doing something they might regret. The service club members provide may be twofold: observation

Continued on page 37

Simple RF Signal Generator

Add this handy piece of test gear to your bench.

J. Frank Brumbaugh W4LJD
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Salinas PR 00751-0030

A good RF signal generator covering from below the 160 meter band to above the 10 meter band with no skips in coverage is a very handy piece of test equipment for the service bench in the shack. Top quality, very well shielded signal generators can cost upward of $1,000, but such extremes are not needed in the usual ham shack.

There are a number of commercial signal generators that are quite adequate but start at around $150. That is too much money, especially when you can easily build a signal generator that is as good or better for no more than $10 or $15 in parts, not including the air dielectric tuning capacitor and enclosure. However, you can build from pieces of unetched printed circuit board a better shielded enclosure than you can buy, and you can do it for pennies.

The signal generator described here is at least as useful as a $150 commercial model, yet it is very simple, easy to construct, and (best of all) requires very few common parts. The only difficult (read: expensive) component needed is the air dielectric tuning capacitor. As this is being written, many sizes are available from: Dan's Small Parts and Kits, P.O. Box 3634, Missoula MT 59806.

I designed this signal generator to use a 150 pF tuning capacitor. Danny lists one at $7.50. However, if you can find a 365 pF tuning capacitor from an old tube radio or at the bottom of some ham's junk box, it can be used in series with a 330 pF NPO disc capacitor in place of the specified 150 pF capacitor. Other combinations of variable and fixed series capacitors will also work. Or, you could tailor the four toroid inductances to cover the desired frequency ranges with whatever tuning capacitor you have available.

This signal generator (see **Figs. 1** and **2**) uses a Franklin oscillator at its heart. Although this oscillator requires two FETs, it is not only foolproof—it *has* to oscillate—but it is also the most stable wide range oscillator I have ever found.

Further, the Franklin oscillator uses no tapped coils, no capacitive voltage dividers, and no special parts. The parallel tank circuit is grounded, making band-switching simple, and the four toroid inductances are switched in individually to provide full coverage with overlaps between bands. There are only four resistors, four capacitors, and two diodes needed to complete this two-FET oscillator, in addition to the tank circuit.

The oscillator is followed by an FET source follower for buffering, which drives an NPN bipolar broadband amplifier. This, in turn, feeds amplified RF through an impedance matching transformer and a -6 dB 50 ohm attenuator, providing RF at 50 ohms impedance, either direct or through a built-in switched attenuator, to a BNC output connector on the panel.

Fig. 2 illustrates the attenuator. RF from the -6 dB attenuator, which terminates the active circuits, is fed through RG-174/U coax to one wiper of a dual wafer switch having at least seven positions. Attenuator resistors are wired onto the two wafers to provide from zero to -30 dB attenuation of the RF available from the signal generator. In addition, position 7 on this switch provides only a 51 ohm shielded resistance, which is applied across the receiver antenna connector when measuring internal receiver noise. This is not normally a part of a signal generator and is therefore optional. It is provided so a shielded 51 ohm

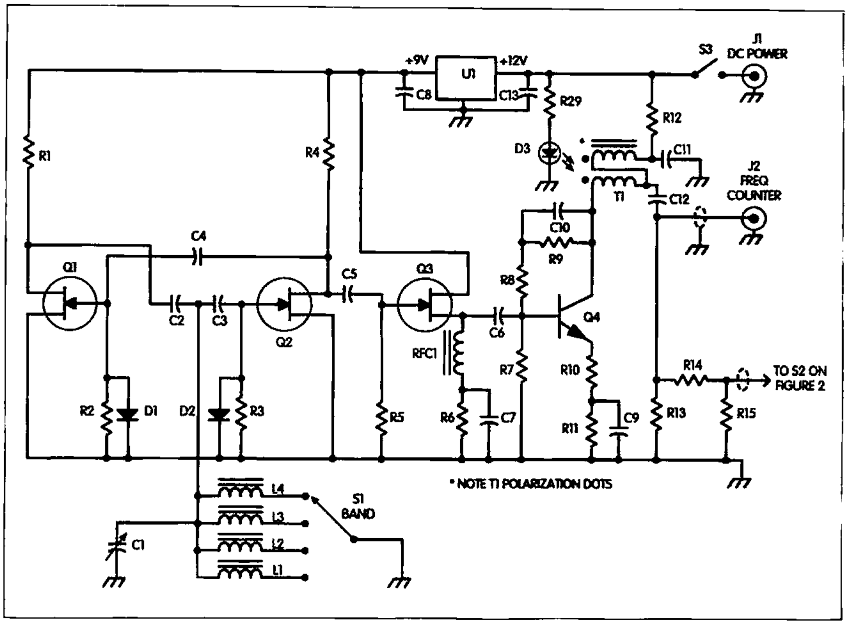

Fig. 1. Schematic diagram.

termination will be readily available whenever needed.

The wafer switch I used for the attenuator does not have a grounded shield between wafers, which would have been preferable. Because of this, there is bound to be some leakage between wafers that will affect the actual attenuation level. Still, it does provide different levels of attenuation and maintains the RF output at 50 ohms impedance.

Specifications

Power supply: 12 to 15 VDC. At 13.8 VDC, current drain is 42 mA.

Frequency range: 1.6 to 32 MHz in four bands, as follows: band A, 1.6 to 3.43 MHz; band B, 3.4 to 7.4 MHz; band C, 7.3 to 17 MHz; and band D, 15.5 to 32 MHz.

RF output: At 50 ohms impedance, output is remarkably level. Band A: low end 1.47 Vp-p. At high end, 1.7 Vp-p. Band B: At low end, 1.98 Vp-p. At high end, 2 Vp-p. Band C: At low end, 2 Vp-p. At high end, 2.6 Vp-p. Band D: At low end, 2.8 Vp-p. At high end, 2.26 Vp-p. Note: These levels were measured as RMS voltages and calculated for peak-to-peak equivalents.

Attenuator (decibels): 0, -3, -6, -10, -20, -30.

Stability: Worst case measured at 30 MHz from a cold start, ambient temperature 82° F. Frequencies were measured at ten-minute intervals to an

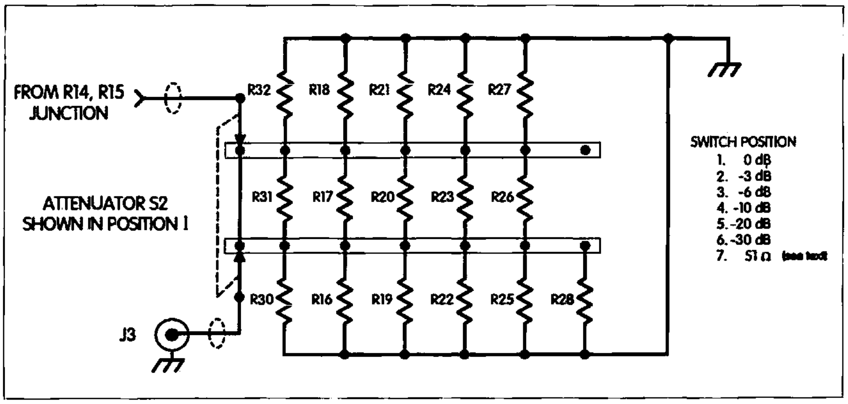

Fig. 2. Schematic diagram of step attenuator.

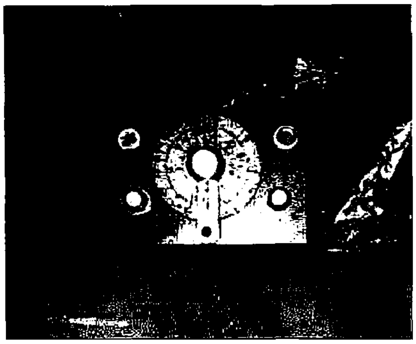

Photo A. Front panel view.

accuracy of ± 100 Hz and rounded off to the nearest kHz. After 30 minutes, the frequency had drifted down 72 kHz, or less than one quarter of one percent.

Stability is a result not only of the Franklin oscillator but also because of the very small amount of heat generated by the circuit. With 42 mA at 13.8 VDC, 0.58 watts of heat is generated, so once the signal generator has warmed up, there will be very little heat-induced drift. Aiding in thermal stability is the thermal inertia of the relatively large tuning capacitor, and the fairly large toroid cores in inductances L1 through L4. Because C1 and any one of the inductances are the only frequency determining components, only they can be affected by the small amount of heat generated by transistors and resistors.

How it works

Q1 and Q2 are asymmetrically cross-connected in a way similar to an astable multivibrator. Because of tolerances in resistors and slight differences in the FETs, the latter will draw slightly different current when power is applied. The capacitive cross-connections ensure that oscillation will begin immediately and be maintained as long as power is applied.

The parallel tuning tank, C1, and one of the inductances, L1 through L4, is lightly coupled to the oscillator at the junction of capacitor C2 and C3.

RF is coupled from the drain of Q2 to the gate of Q3, configured as a source follower. Operating voltage for the oscillator and source follower are provided by U1, a 9 volt regulator.

RF developed across RFC1 is capacitively coupled to the base of Q4, an NPN bipolar broadband RF amplifier essentially flat over the range of the signal generator and beyond. Negative feedback and emitter degeneration are incorporated to provide broadband amplification. The output impedance of Q4 is approximately 200 ohms. T1, a 4:1 impedance matching transformer, injects RF at about 50 ohms impedance to a -6 dB attenuator to provide a stable and solid 50 ohm RF output.

RF from the -6 dB attenuator is directed through RG-174/U coax to a connector on the rear of the enclosure for use in monitoring exact output frequency. Another short length of RG-174/U coax takes RF from the -6 dB attenuator to one wiper of a wafer on the attenuator switch. See **Fig. 2.** This switch selects from 0 dB (the output from the -6 dB internal attenuator) to -30 dB in steps at -3, -6, -10, -20, or -30 dB. The wiper of the second wafer connects to the BNC RF connector on the panel. (The next switch position, number 7, selects only the shielded 51 ohm resistive termination for measuring receiver noise, if included.)

Construction

I recommend using a small general purpose printed circuit board for greatest ease in wiring. I used a Radio Shack 276-150 PC board that provides more than enough room for all the circuitry as well as all four toroid inductances. Of course, you can build it "dead bug"–style if you wish. Just remember that frequencies as high as 30 MHz are present, so follow good engineering practice with short leads, and use the types of components specified in the parts list. When the inductances are trimmed to cover the exact ranges desired and wired into the circuit, use a non-acid containing "goop" or beeswax to secure them to the PC board so that they will not shift or break the fine wire used to wind them.

I used a 365 pF tuning capacitor from my junk box (the last one), with a 300 pF NPO capacitor in series with it for tuning. This method, while providing the desired capacitive range, tends to compress the high frequency ends of the dial. I bent up a bracket to mount the capacitor and added a Jackson Brothers vernier salvaged from an ancient Eico sweep generator. I used a circular dial plate left over from cutting a meter hole in another project, with white card stock adhered to one side, and arcs drawn and calibration added after construction. (These are not stipulated in the parts list, because each instrument is going to be a little different.)

I used a Ten-Tec TG-34 enclosure, about 4" x 4" x 3" high, for my own signal generator, although a case made of unetched printed circuit boards would allow discretion in the size of the panel (which determines how large a dial can be used) as well as provide better shielding. However, because I bolted my PC board with all circuitry on the left end of my tuning capacitor,

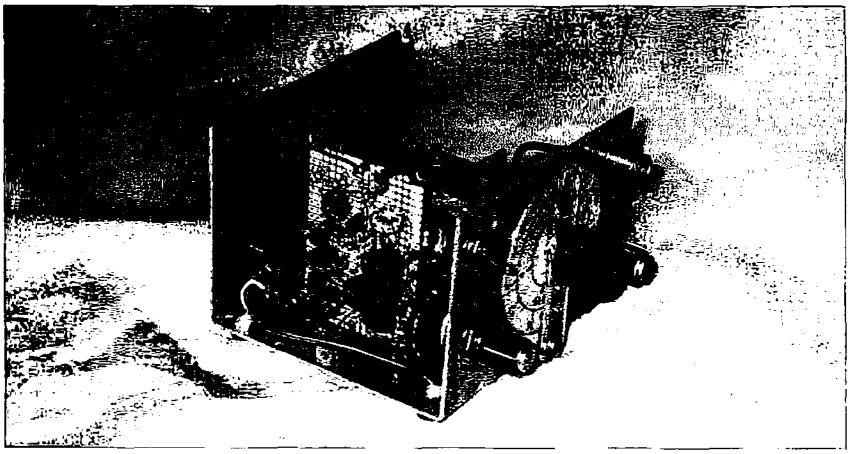

Photo B. Left side view. Entire circuitry is on small PC board, with band switch forward.

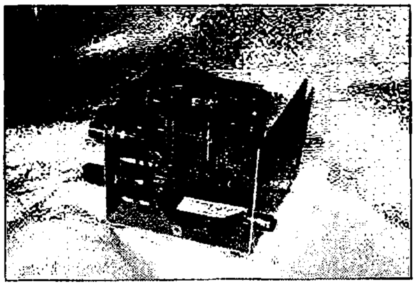

Photo C. Right side view showing attenuator switch and frequency counter connector.

and the inductances are all on toroidal forms, there is a little stray RF inside my enclosure. Probably only the stator of the tuning capacitor could be a source of stray RF in the enclosure, so I expect it is at least as well shielded as a $150 commercial generator, and probably a bit better, especially considering the low level of RF being generated.

Because of tolerances—no two toroid cores of the same type are identical, and no two tuning capacitors rated identically are ever quite the same—the winding data given for L1 through L4 are what worked for me with my specific cores and particular tuning capacitor and series capacitor. Because your parts will be somewhat different, you may have to adjust the number of turns on each tuning inductance to get the proper frequency coverage and adequate overlap between bands.

I suggest using the winding data given, but adding a few turns before checking the frequency range of each band. Thus, I suggest you start with L1 on Band A, getting the low frequency limit a bit below 1.8 MHz, the low end of 160 meters, and then check the high frequency end. This becomes the frequency a bit higher than what you will set the low frequency end of L2 at to provide overlap. Continue in this manner with L3 and L4. Your actual bands will, no doubt, be somewhat different from mine, but as long as you can generate RF from less than 160 meters to more than 10 meters with no skips between bands, you will have a stable and very useful instrument.

General comments

In the parts list, resistors R13 through R27 and R30 through R32 are first listed with the standard 1% resistance values for the attenuator, and then followed by a suggested 5% 1/4 watt resistor. Actually, little will be lost in an instrument this simple if you use the nearest 5% resistors in these locations.

However, for the purists out there, it is possible to make resistors of the exact values by carefully filing the bodies of lower value resistors while monitoring the value of resistance with an ohmmeter. To exclude dampness from the filed portions of resistors, apply some Q-Dope®, clear fingernail polish, or a product called "Hard As Nails" (used to overcoat nail polish). When all toroids are checked and cover the desired frequencies, use one of these products to coat them and hold the winding in place as well as to keep out moisture.

Q1 and Q2 *must* be the same type, and it is probably preferable that the same type be used for Q3. I used J309s, but 2N4416 or J308 should work as well. The 2N4400 I used for Q4 can be just about any small signal NPN transistor as long as the F_t is at least 300 MHz (and preferably higher).

Do not change the values or types of C2, C3, C4, C5, and C6, although if you cannot locate 18 pF NPO capacitors for C2 and C3, you can substitute 15 pF or 22 pF. However, both capacitors must be marked with the same value and be NPO. If you don't have an FT37-43 ferrite toroid for T1, you can use an FT50-43 with no change in windings.

Where a 0.1 µF capacitor is shown in **Fig. 1** in parallel with a resistor, use a monolithic capacitor, axial if possible, and solder it across the resistor before adding them to the circuit.

For most casual use around the shack, it will not be necessary to use the built-in attenuator. You can just wire a potentiometer between the junction of R14 and R15 to ground and connect the wiper to the BNC RF output connector on the panel. Adjusting the pot will change the RF level, but the impedance will no longer be 50 ohms. Or, if you have constructed the switched attenuator described in the *ARRL Hand-*

Continued on page 36

Parts List

Part	Description
R1, R4, R7	1k
R2, R3, R5	1 meg
R6, R11	100 ohms
R8	560 ohms
R9	3.3k
R10	10 ohms
R12	47 ohms
R13, R15-16, R18	150.5 ohms 1% (use 150)
R14, R17	37.3 ohms 1% (use 36)
R19, R21	96.2 ohms 1% (use 100)
R20	70.7 ohms 1% (use 68)
R22, R24	61 ohms 1% (use 62)
R23	247.5 ohms 1% (use 240)
R25, R27	53.2 ohms 1% (use 51)
R26	789.7 ohms 1% (use 820)
R28	51 ohms
R29	2.7k
R30, R32	292 ohms 1% (use 300)
R31	17.6 ohms 1% (use 18)
All resistors 1/4 W 5% unless otherwise noted.	
C1	150 pF air dielectr. tuning cap (see text)
C2-3	18 pF NPO disc (15 or 22 pF acceptable)
C4-5	100 pF COG monolithic capacitor
C6	56 pF COG or NPO disc
C7-13	0.1 µF monolithic, axial
D1-2	1N914, 1N4148, etc., silicon small signal diode
D3	LED, your choice
J1	DC connector, your choice
J2	connector for freq counter, your choice
J3	BNC panel-mount coax female connector
L1	FT37-61, 29T #30 (see text)
L2	T68-2, 45T #30 (see text)
L3	T50-2, 18T #30 (see text)
L4	T37-6, 11T #30 (see text)
Q1-3	J309 (see text)
Q4	2N4400, 2N4401, 2N2222, etc.
RFC1	1 mH RFC
S1	SP4T rotary switch
S2	2P dual wafer, 7 or more pos. Should have grnded shield between wafers.
S3	SPST toggle or slide switch
T1	FT37-43 12 bifilar turns #30
U1	78L09 regulator

book, you can use it outboard and not build-in the specified attenuator.

Changes you might want to make

Frequency coverage can easily be extended above and below the specified ranges by adding additional inductances and positions on the band switch. Within reason, of course. It probably won't work at UHF!

If a higher level of RF output is desired, one or two MMIC wideband amplifiers can be added to maintain the 50 ohms output impedance. Or, for really higher RF output, you could build and install the four-stage RF amplifier described on page 135 of W1FB's *QRP Notebook*. It is flat from 1 to 40 MHz and provides 40 dB gain at 50 ohms impedance, but this may be too high for the internal attenuator.

As designed, this signal generator can also be operated portable with either a 9 V or 12 V battery. If a 9 V battery is used, eliminate U1. In this case, RF output will be lower and will decline as the battery ages.

If you desire, you could install an LCD frequency dial such as the "K1MG Digital Clock/Counter" available from Blue Sky Engineering Company, 400 Blossom Hill Road, Los Gatos CA 95032. Write for the current price—but be forewarned that this will probably cost about twice as much as the rest of the instrument.

Y2K Portable J-Pole

continued from page 18

It remains to be seen whether the year 2000 will bring some special, urgent need for ham radio communications, but I see Y2K as a good excuse to review and upgrade my preparations for emergency communications. If Y2K turns out to be a dud, there's always another disaster waiting around the corner somewhere, sometime. If you get ready now, Murphy's Law dictates it will happen somewhere else (maybe)!

Note: A parts kit consisting of coupler PC board, trimmer capacitor, and ladderline is available. Order #JPK-2 from Lectrokit, 401 W. Bogart Rd., Sandusky OH 44870. The price is $15 postpaid in the USA and Canada. Questions or comments? Please use my E-mail address shown above.

Secrets of Transmission Lines

continued from page 29

$i = [V_0/(j*w*L)]$ amperes
(2-14)

The term $(j*w*L)$ is called the *inductive reactance*. It describes the opposition to AC current flow just as resistance does for DC in Ohm's law.

In practical inductors, there is always a resistance in the circuit too. Since the resistor tends to draw current in phase with the voltage, the terms combine as follows:

$i = V/[R + (j*w*L)]$
(2-15)

The term $[R + (j*w*L)]$ is called *impedance*. Impedance plays the same role in relating voltage and current for AC as resistance plays for DC. We will see shortly that capacitance may also enter into impedance.

For the capacitor, we noted that:

$V = Q/C$ volts

where

Q = the integral of current with respect to time, measured in coulombs or ampere seconds

If the capacitor drew an average of one ampere in the first second, a half ampere in the second, and a quarter ampere in the third and so forth, then Q would be equal to 1 + 1/2 + 1/4 + ...

Now, applying an AC voltage, we obtain:

$V_0*\sin(w*t) = Q/C$
(2-16)

Differentiating the above expression with respect to t, we obtain:

$d_Q/d_t = [V_0*w*C*\cos(w*t)]$ amperes
(2-17)

Note that if Q is the integral of current with respect to time, then d_Q/d_t is current.

Taking again the liberty that for most problems we are interested only in long-term averages we may write that for a capacitor:

$$i = V/[-1/(j*w*C)] \text{ amperes} \quad (2\text{-}18)$$

Note the similarity and the differences of the result for the inductor and the capacitor. Whereas the instantaneous current in the inductor is given by -cos(w*t), the instantaneous current for the capacitor is given by +cos(w*t). Also, where the inductive reactance is given by (j*w*L), the capacitive reactance is given by -1/(j*w*C). We also see that inductive reactance is directly proportional to inductance, whereas capacitive reactance is inversely proportional to capacitance. The reactances are usually referred to as X_L and X_C respectively.

An interesting case occurs in the event that $X_L = -X_C$. If the two elements are connected in parallel and both are theoretically perfect with no losses, it takes no current on the main line to excite a large current in both elements. The case is similar to the pendulum shown in **Fig. 6**.

At the end of the swing, all of the energy is stored in the form of potential energy like a capacitor. At the bottom of the swing, all of the energy is stored in the motion of the bob, like the magnetic field of the inductor. As the bob continues its swing to the other end of the travel, all of the energy is converted again into potential energy in the capacitor.

In the parallel circuit the energy simply sloshes back and forth between the inductor and the capacitor. If no losses existed in the circuit, and the pendulum dissipated no power, both would continue forever!

Conclusion

Having seen some of the characteristics of reactive elements, next time we'll deal with some real circuits and discuss power factor, power dissipation in an alternating current circuit, and the difference between kilowatts and kilovars.

Getting Your Foot in the Public Service Door

continued from page 31

and prevention. With either type of activity, your club, the police department, and your community wins. You can feel good about doing your part. It's a great way to add value to your license and your hobby. It may also help protect our frequencies.

Make it a point to contact your local police chief or commissioner and talk with him about a joint activity with their department. If they have any questions about how well the operation works, ask them to call Chief Rick Chandler of the Dickson, Tennessee, Police Department at (615) 446-5403. He has been involved with our local amateur radio group for several years. There have been no complaints.

QRX

continued from page 7

"I won't let a flat tire get me down!" Tom said, without despair.

These appeared in the December 1998 issue of *Spurious Emissions*, the newsletter of the Indian River ARC, Roy Hill W6QCM, editor, and were reprinted in the February 1999 issue of the *ARNS Bulletin*.

Simple Direct-Conversion Receiver

For QRPers and receiver aficionados in general.

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c/o Mallard Meadows RHC
476 Belmont St., Room 405
Waymart PA 18472

An essential ingredient for the newcomer in amateur radio is a good receiver, one that is sensitive enough to pick up signals that are down near the noise level, and selective enough to separate adjacent signals and provide clear copy. Without such a receiver, you can only look forward to "unanswered" CQs and lots of frustration. However, a good communications receiver can cost anywhere from $250 to $500, and most beginners don't have that kind of money. Even a good *used* receiver can cost $150.

As an alternative, a direct-conversion receiver should be tried. It performs well over a range of 3.5 to 4.3 MHz on AM, SSB, and CW, and is easily constructed at a cost near $30. Direct conversion is a much neglected type of design that can best be described by comparison with the more common system, superheterodyning.

In the superhet system (see **Fig. 1**), the first stage is an RF amplifier. This is followed by a mixer, where the signal is combined with the output of a local oscillator. The frequency of the latter is a certain amount above or below that of the RF, and the difference is called the intermediate frequency. The output of the mixer contains a high-frequency component and a low-frequency component. These two signals are produced by superheterodyning—that is, combining two signals to produce one at a frequency equal to the sum of the frequencies of the original signals, and one at a frequency equal to their difference.

At this point, we filter out the high-frequency component and amplify the lower in a stage that has high gain and a narrow passband, which affords selectivity. The output of the IF amplifier is sent to a detector, which may be of two types: For AM reception, it is an envelope detector (a diode followed by a low-pass filter). For SSB and CW, a product detector that is really a second mixer, fed by a beat frequency oscillator (BFO), is used. The difference component of this heterodyning process is an audio signal that is then amplified through one or more stages and passed on to phones or a speaker.

As you can see, there are usually four or more stages that must be properly tuned in conjunction with each other for proper signal recovery in a superhet receiver. Most quality communications receivers have two or three IF stages, with separate mixers, local oscillators, and tuned amplifiers for each stage. These complications drive the cost of receivers out of the reach of a large portion of newcomers to the radio hobby.

The direct conversion technique is a much simpler process. The block diagram of this system is shown in **Fig. 1**. The RF amp supplies the mixer with an amplified version of the signal received from the antenna. The mixer is also fed an RF signal of the same frequency as the incoming carrier from a local oscillator whose frequency is adjusted by the main tuning dial C26. The output of the mixer contains one audio frequency signal and one RF signal at twice the frequency of the original. The RF signal is then filtered out by a low-pass filter and we are left with an audio signal. This is then amplified by one or more stages of high gain, and the output is connected to a speaker or a pair of phones.

That's all there is to it. We have none of the complexities of dual- or triple-conversion superhet receivers, but do

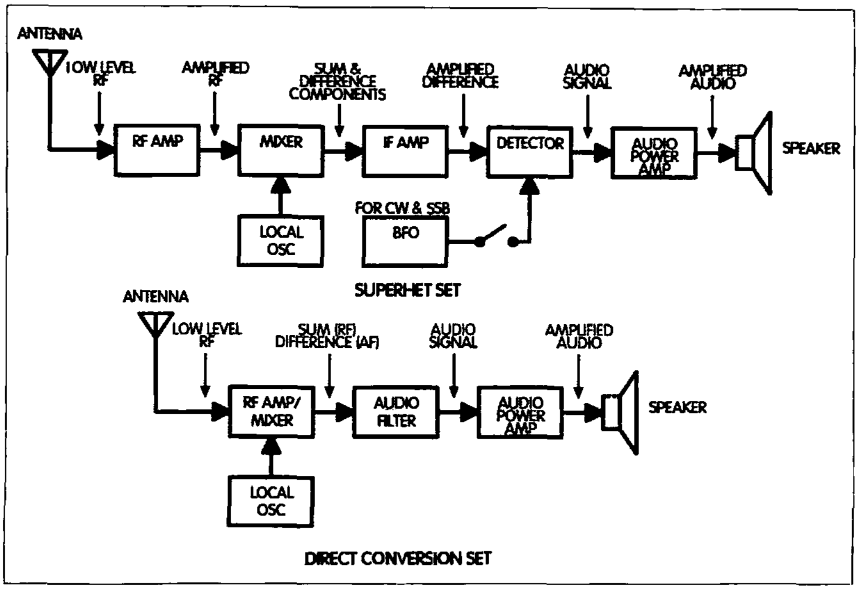

Fig. 1. Superhet (top) and direct-conversion sets compared.

have good sensitivity, and if we use a high-quality, narrowband audio filter, we have selectivity that will rival that of a superhet unit costing ten to twenty times more. The simplicity of operation is reflected in the ease of construction.

Circuit operation

A comparison of the block diagram (**Fig. 1**) and the schematic diagram (**Fig. 2**) will point out a few differences. For economy's sake, an RF amplifier has been omitted from this receiver. However, the receiver is still sensitive enough to pick up many signals that would be missed with a cheap "communications-type" superhet model. Signals from the antenna are coupled to the MOSFET mixer, Q1, over the tuned LC circuit composed of L1, C1, and C2. Transistor Q2 is the local oscillator and its output is coupled through a small silver mica capacitor, C28, to the second gate of Q1. The antenna coil L1, and the oscillator coil L2, are wound on small toroidal cores, which is an effective way of attaining high Q circuits—the basis of the selectivity of the receiver's front end.

The other contributor of selectivity in a direct-conversion receiver is the audio filter. This filter performs two functions: It rejects the high frequency component of the mixer output, passing the audio signal, and it provides a large part of the receiver's selectivity by virtue of its audio bandpass characteristics. In this circuit, L3, C5, C7, and C8 comprise the low pass filter. Coil L3 is a variable TV-width coil, and the capacitors are of the mylar type. Capacitors C1, C25, C27, and C28 are NPO or silver mica types. Op amp IC1 is a conventional audio amplifier, and almost any op amp will work well in this circuit. Variable resistor R10 serves as a volume control in the standard voltage divider mode, and IC2 serves as an audio output amplifier. Any one of the common audio modules furnishing 0.5 to 1 watt output can be utilized for this purpose. If desired, a headphone jack can be installed.

A power supply was not incorporated into the receiver. A suitable source supplying 500 mA at 12 V should be used. If you intend to use the receiver for portable operation, or don't wish to construct a supply, six to eight D cells in series will work fine. An inexpensive battery holder can be obtained for holding them. It is important to take care in observing polarities while connecting

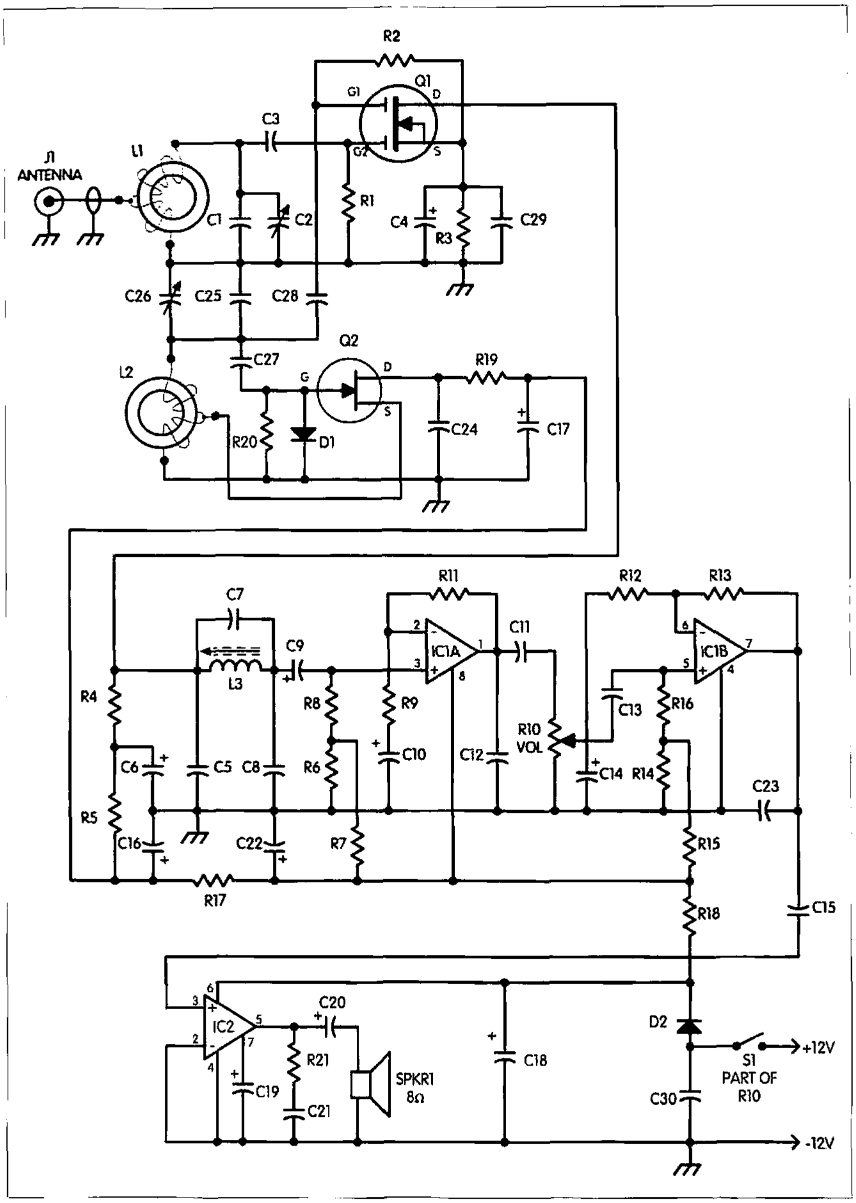

Fig. 2. Schematic.

the supply. To protect the sensitive semiconductors, diode D2 has been incorporated. If the wrong polarity is applied to the receiver, D2 is reverse-biased and will not conduct. If this diode is not installed, the FETs and ICs would be destroyed in the event of accidental reversal of power supply polarity. However, when incorrect polarity is applied, the receiver simply will not work, thanks to the protective action of D2.

Using other frequencies

The receiver can also be used on other frequency bands. Only the LC combination at the input of the mixer and the tuned circuit of the local oscillator need modification. For 40-meter operation, remove C1. Remove L2 and replace it with 15 turns of #22 enameled wire, wound uniformly spaced on a T50-2 toroid core and tapped 7 turns from ground end. Also, connect a 225-pF silver mica capacitor in parallel with C25.

For 20 meters remove C1 and wind a new oscillator coil L2 on a T50-2 toroid core. It should be 7-1/2 turns of

Parts List

Part	Description
R1-2, R8, R16	100k ohms
R3	560 ohms
R4	2.2k ohms
R5, R17-19	100 ohms
R6-7, R14-15	10k ohms
R9, R12	4.7k ohms
R10	10k pot w/ S1 SPST switch (fr. panel)
R11, R13	47k ohms
R20	27k ohms
R21	10 ohms
All resistors 1/4 W unless otherwise noted.	
C1	200 pF NPO disc or silver mica
C2, C26	100 pF var. tuning cap (fr. panel)
C3	22 pF disc
C4	22 μF electro 16 WVDC
C5, C8	0.02 μF mylar
C6	50 μF electro 16 WVDC
C7	0.01 μF mylar
C9, C10, C14	4.7 μF electro 16 WVDC
C11, C13, C15, C30	0.1 μF disc
C12	0.01 μF disc
C16-18, C20, C22	100 μF 16 WVDC
C19	10 μF 16 WVDC
C21	0.05 μF disc
C23-24	0.005 μF disc
C25	180 pF NPO disc or silver mica
C27	47 pF NPO disc or silver mica
C28	4.7 to 5 pF NPO disc or silver mica
C29	0.01 μF disc
All capacitors 50 V unless otherwise noted.	
Q1	dual-gate MOSFET RCA 40673, 3N140, or 3N141
Q2	2N3819 or MPF102
IC1	LF353 dual op amp
IC2	LM386 power amp
D1	1N914 signal diode
D2	1N4001 diode
L1	34T #22 enam. wire tapped at 11T from grnd
L2	34T #22 enam. wire tapped at 5T from grnd
L3	10 to 50 mH var. coil (Miller #6319) or color TV convergence coil from junk TV

L1 and L2 are wound on a T50-2 toroid core available from Palomar Engineers or Circuit Specialists. Q1, Q2, IC1, and IC2 are available from DC Electronics, P.O. Box 3203, Scottsdale AZ 85257.

Table 1. Parts list.

#22 enameled wire, evenly spaced and tapped 2-1/2 turns from ground end. Remove the 225 pF capacitor across C25 if it was installed for 40-meter operation.

For 10 and 15 meters, L1, the antenna coil, must be replaced with 8 turns of #22 enameled wire wound on a T50-2 toroid. The L2 coil must be replaced with 5 turns of #22 wire, tapped at 2 turns from ground end. In winding both coils, spread the turns to space them evenly around the forms. If you wish, some sort of band-switching or plug-in coils could be used.

Alignment

Making sure that you observe correct polarities, connect a 12 V battery to the receiver. Connect a speaker and antenna to their respective jacks. Turn the audio volume control until you hear the "rushing" sound of the atmospheric noise. Rotate the preselector capacitor C2 slowly. At one point there will be a noticeable increase in sound in the speaker. Carefully adjust C2 for this peak. There is only one adjustment for receiver alignment, setting the value of inductance of L3. This prevents any RF components from local oscillator feedthrough or the heterodyne process from entering the audio stages of the receiver. The procedure is very simple. Adjust L3 until the tuning slug is positioned about halfway into the coil. This completes the receiver alignment.

Using the receiver

As you tune across a band, keep the front end of the receiver resonant by adjusting the preselector capacitor C2. You will notice one basic difference in receiver operation between the direct-conversion receiver and a superhet. On the conventional receiver, there is a mode switch that must be adjusted for the type of signal you want to receive. When this switch is in the SSB/CW position, it activates the BFO and product detector. It is not possible to properly demodulate such signals when the switch is in the AM position, which directs the signal to a simple envelope detector.

With the direct-conversion receiver, no such switch is necessary and any signal (CW, AM, SSB, or FM) is properly detected just by adjusting the frequency of the local oscillator, which is accomplished by turning C26, the main tuning dial. Thus the direct-conversion receiver provides many advantages over the superheterodyne model. It is less expensive, easier to build, and simpler to operate. Try it, you'll like it!

Reference

For interesting information by Joseph J. Carr on the theory of direct-conversion receivers, see *Popular Electronics*, August 1997, pages 39ff.

NEVER SAY DIE

continued from page 4

to the then just budding electronics industry, we also provided 40,000 technically experienced men to our military when WWII started. I was one of them. I was there. The special electronic schools were packed with hams, both as instructors and as students — where we learned all about radio, radar, and sonar.

Hams developed and pioneered FM, NFM, SSB, SSTV, and so on. We were in the vanguard. It was our repeater systems that spawned cellular telephones.

But that was then and this is now. It's been decades since we've contributed much to society in payment for the use of tens of billions of dollars' worth of frequency spectrum. We're not even needed for emergencies unless the cellular phones — and that includes the new Iridium system — break down. I had an opportunity to try out Iridium with a call from a ski slope in Aspen to a good friend in Miami. Loud and clear, and all by satellite, at $7 a minute.

We could still earn our salt if the ARRL directors would get off their numb butts and start promoting the hobby. When is the last time you saw amateur radio portrayed positively in a TV show? Or in a magazine article in a major magazine? In the news, for that matter? We've become the invisible hobby ever since the ARRL closed down virtually all high school radio clubs 35 years ago.

The one potential I see for amateur radio is as a way to get youngsters interested in high-tech careers. Before the League closed the high school radio clubs, 80% of all new amateurs were teenagers, and that's according to an ARRL study at the time. Further, 80% of those went on to high-tech careers as a result of this interest. I remember when virtually all heads of electronics companies were hams.

But I've written about this endlessly, so it's probably snore material.

Are you a supporter of the League's efforts to do a little tinkering with our regulations? Do you care?

I proposed we cut the baloney and have one class of license. One. Splintering us up into six license classes has not helped strengthen the hobby, it's tended to help destroy it. And ditto the League directors and their continued pressure to maintain the code barriers. Phooey on them.

Paul Schleck K3FU, in his comments to the FCC, mentioned several Morse code myths: (1) It gets through when nothing else will. Bull, we've had technology that beats the heck out of CW for weak-signal communications. (2) CW takes up very little bandwidth. Fiddlesticks. It's the amount of data per unit bandwidth that counts. (3) Morse proficiency makes for better operators. If only! Our worst offenders have been Extra class hams. Only two people have ever been prosecuted for bad language on CB and put in prison. Both were Extra class hams. (4) High speed code exams keep down the crowding on HF bands. Nonsense, when things get crowded, we pioneer new communications systems and explore underused bands. HF crowding is no worse today than 60 years ago — and I was there. You know, if we'd change from SSB to DSB we could triple or better our occupancy, and with less interference. Unfortunately, Art Collins WØCXX put in the fix with generals LeMay and Griswald 40 years ago, and the G.E. brass refused to push Dr. John Costa's superior DSB system. Collins Radio made millions. Big business won over technology, as usual.

The ARRL tells the FCC that they're speaking for you, but unless you're a CW old-timer, that's a crock. Remember, 80% of all amateurs have had the opportunity and have refused to join the League. If the League opinions represented those of most amateurs, they'd have more like 80% of all hams as members. If you are not a member, when is the last time you got a survey from the League asking why? If you are a member, when is the last time you got a survey asking what you thought about something? I've been a member for 61 years and I'm still waiting for a survey. At least the FCC asks before they dump on us. The ARRL directors feel they

know more than we members do, so why should they bother to ask?

Smoking

The *73* magazine building is right next to the Peterborough high school, so I see lots of kids walking past the place. A few are dressed well, but many are wearing baggy pants and baseball caps on backwards. When I see these kids, I know they are unable to think for themselves. They're busy copying what others do.

A distressingly high percentage of these baggy-pants kids are smoking as they walk by. Starting to smoke as a teen these days is a sure sign of incredible stupidity. Kids sure have to be really dumb to start a lifelong expensive addiction to a drug that is going to ruin their health and take years off their life.

Sorry, but I don't think much more of adults I see smoking. Tens of millions of smokers have managed to kick their addiction, which leaves the stupid and the people with weak wills as the remaining addicts.

Maybe you've noticed that the villains in the movies and on TV no longer wear black hats, they're smoking. When you see someone light up in a movie you know immediately that this is going to be one of the bad guys.

Back when Camels was advertising that doctors smoked 'em, it was smart to light up, and you'll see all of the now-dead movie stars smoking. And, like John Wayne, it killed most of 'em while they were still relatively young.

Thirty years ago or so, when I outlawed smoking in my company, I was one of the first. Back in 1965, I was giving away cancer-free matches at hamfests. I had 'em made up specially so they wouldn't light.

The Wild West

Aren't you glad we live in a country with town, county, state, and federal police, backed up by town, county, state, and federal courts — with town, county, state, and federal prisons? Aren't you glad we don't have to live like they used to in the lawless West that we've seen depicted in westerns?

That is, unless you do some reading. It turns out that the frontier West in the 19th century was a far more civilized, more peaceful and safer place than America today. They had private justice then and it worked. Our 13 colonies had little government law enforcement. It was done privately.

The sorry fact is that government hasn't been able to do much about crime. Studies have shown that having more squad cars or police on the beat, or even faster police response, has little effect on crime rates.

Are there other systems than ours around the world that work better? Of course there are. But ours has a life of its own. There's a huge constituency for continuing our present system of police, courts, and prisons, and no constituency for any alternatives, no matter how much better and less expensive they have been shown to be for the public and crime victims.

Read *To Serve and Protect* by Bruce Benson ($37.50) to put the situation into perspective and see how you (and all of us) have been screwed again by government. Gee, what a surprise! I know it's hard to believe that a government service could be both ridiculously expensive and ineffective. Please name one government service that is not ridiculously expensive and ineffective. Just one, please.

Sanctions

I know you're not going to believe it if I try to tell you that your government has been lying to you again — that it has been wasting billions of your money. So I'm not going to try to convince you. Instead, I ask that you invest a lousy $9 and discover the sorry facts for yourself.

You may even get mad when you read how you've been hornswoggled again by the administration. This has to do with the use of economic sanctions as a weapon of foreign policy. Sounds great, right? Well, that should be a clue right there if you're awake. Anyway, the Cato Institute has collected papers from some of the top brains who cite chapter and verse how sanctions have not only seldom been more than an irritant to the intended victim, but have instead cost us dearly.

Get *Economic Casualties: How U.S. Foreign Policy Undermines Trade, Growth, and Liberty*. ISBN 1-882577-75-2.

The message of *Economic Casualties* is clear and compelling: Unilateral sanctions are truly self-inflicted wounds. They do to us in peacetime what our enemies try to do to us in wartime.

Yeah, there goes Wayne, bothering you again over something you can't do anything about. Say, do your senators know who you are? I guarantee you mine know who I am. And they know I have a big word processor.

Fuming

I clipped a little note from *Time* about a study of 4,000 Danish men which showed that mothers who smoke a pack or more a day are twice as likely to produce criminally violent sons. Those who smoked fewer cigarettes had less violent boys. The chemicals in smoke somehow permanently damage the fetal brain. If lung cancer, heart disease, and stroke aren't enough to scare you off smoking, perhaps this will.

Nicotine is a drug. Crack is a drug. Alcohol is a drug. *Any* drugs that get into a mother's bloodstream while she is pregnant are going to affect the development of the child, and the effects are going to be negative — such as lower intelligence, deformities, slower development, aberrant behavior, and so on. Do you really want to cripple your child even before it is born? Cripple it for life?

Researchers have shown that the use of drugs is not only harmful to babies, but will also alter both the sperm and mother's eggs even before conception. Secondhand smoke is also a drug when breathed.

Hmm, both my father and mother smoked and drank. I wonder what I might have been like if I hadn't been damaged by those drugs when a baby. And by childhood inoculations.

Buzzards

I looked up from my computer and there, in the front yard, were two big does and a baby deer. Bambi. They were cautiously munching on the hedge. Well, the snow had just melted a few days before and only one crocus had blossomed so far, so there wasn't a lot for the deer to eat.

While Sherry and I were watching the deer, Sherry called out that there were some turkeys in the pasture across the road. I got out the binoculars to get a closer look. They didn't look like turkeys, though they were big and black. But they were fanning out their wings in the morning sun and I've never seen turkeys do that. A closer look showed them feasting on something dead. Buzzards, not turkeys. Three on the ground and one circling lazily over them.

Hmm, were they eating one of our rabbits? I went across to the field and took a look. Nope, it was a dead raccoon. There was a lot of raccoon fur nearby, so it put up a fight before it got killed — probably by whatever has eaten most of the pet rabbits we had running around the house and barn. Coyotes, probably.

Azomite

Plants seem to do as well as people when they get all of the minerals they were designed to use. If you'll read *The Secrets of the Soil* by Chris Bird, which I've reviewed in my "wisdom" guide, you'll find that in addition to the dozen ways I discussed last year in an editorial for getting plants to grow bigger, faster, and producing better

Continued on page 61

Number 43 on your Feedback card

Above & Beyond

VHF and Above Operation

C. L. Houghton WB6IGP
San Diego Microwave Group
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San Diego CA 92119
[clhough@pacbell.net]

Microwave converter drivers and interfaces: part 2

This month, let's cover some of the trials and modifications of another 2 meter rig, the IC-202 SSB transceiver. Additionally, I will show some of the interface equipment used to tie together an IF transceiver and the microwave converter.

The interface equipment is necessary in addition to low power drive to protect the microwave mixer at all costs. While mixers can be home constructed (with difficulty), commercial mixers do provide better operation parameters (and therefore are hard to find and expensive). If you are lucky to come upon one for your converter for 5 or 10 GHz or higher frequencies, these are the mixers that are truly "unobtanium"!

Mixers above 1 GHz are not too shabby either, but are a little more plentiful in surplus. Home construction at these frequencies is quite a bit easier, as the physical 1/4-wave dimensions for lumped mixers make circuitry larger and easier to work with. For instance, a mixer for 2.3 GHz is about 2 inches square, while a 10 GHz mixer of similar design would be slightly larger. Stability and balance in mixer design become even more critical as frequency increases and circuitry size decreases.

Protection circuits for microwave converters and mixers is not complicated. A very easy-to-construct circuit proposed by members of the North Texas Microwave Society is quite easy to construct and affords very good protection for the converter. Instead of making a direct connection between the converter and transceiver through switching a coax relay, the relay is retained but in the receive path an MMIC amplifier with 10 dB gain and an attenuator of 10 dB loss is inserted. In the transmit path, an attenuator of approximately 10 dB is inserted for 100 mW drive from the transceiver.

Remember, we are using low level mixers requiring a maximum of +7 to +10 dBm drive, and with a power output of 100 mW or +20 dBm we have some dBs to get rid of still. The power is quite low level and can be removed simply with 1/4-watt carbon resistors. The value of the attenuator is adjusted to take into account remote operations such as tower mounting the converter some 100 feet remote and being able to still get normal drive level to the converter so remotely situated.

The beauty of such a circuit is that in case of transfer failure (that is, you are transmitting into the receive path of the converter), you do not put power directly into the mixer IF port and possibly destroy it. In this failure scenario, you are now driving the 10 dB attenuator in the receive circuit and an MMIC amplifier backwards. I guarantee you, it's quite a lossy circuit and will fully protect the mixer from even much higher power in extreme conditions.

The transmit path (after RF detection and auto switching the IF path to transmit) is protected by the 10 dB attenuator. If high power is applied and switching takes place, the power is reduced 10 dB but is still too high for mixer safety. You can't protect from everything, but if you reduce your driving transceiver to low power operation for microwave converter service, it will not be a problem. With the MMIC amp an attenuator in the receiver path and 10 dB attenuator in the transmit path with low power drivers will afford you protection for all of your microwave converters.

IC-202 2-meter modifications

Modifications to the IC-202 SSB 2-meter transceiver for microwave converter use are not extensive and can be done fairly quickly. A little background on the ICOM IC-202 2-meter SSB transceiver: It's battery powered from 9 internal "C" cells or a 12 volt DC power source. Its main operation is USB only. There is a newer model, the IC-202S, which is more popular as it provides for both USB and LSB. I have the plain vanilla model and it required conversion to LSB, the designated mode for most operation on microwave. The mod here is quite simple: Order a HC-18 solder pin crystal for 10.701500 MHz and change the crystal in the carrier inject circuit.

I came upon a pack of NiCd "C" cells and have been using them ever since. Matter of fact, with the low power mod and high capacity NiCds I haven't charged the battery pack in 6 months and the radio continues to function quite well. I know that's pushing the batteries to extreme, but it's better than purchasing dry cells, which are not inexpensive. I picked up the "C" cell NiCd pack at a swap meet, removed the cells, and inserted them in the radio's battery clips and that was it. They have performed very well ever since, and quite reliably, I might add.

The low power modification to most rigs was stumbled upon many years ago when a blown transistor in a final amp stage proved quite difficult to find a replacement. Most standard replacement transistors have the collector tied common to the outside case for heat sinking purposes. The device that was blown had the collector insulated from the TO-5 case. I could not find a replacement for this device anywhere. On a lark, I wanted to see how the remainder of the transceiver functioned on transceive, so I connected a few-pF capacitor from input to output of the final amplifier stage. Wow! It did the job, provided 100 mW of very nice power, and has ever since! What a stroke of luck — it functioned well not only for a simple test, but has been the main rig for Field Days ever since. The rig in question is an old Santec LS-202 hand-held multimode 2-meter transceiver that was obtained as a basket case that needed lots of repairs, as it came in parts.

It proved to be an act of love to restore this old Santec LS-202, as the synthesizer was dead, the audio circuit was dead, and wires were hanging out of its two clamshell parts. It also had the final transistor removed (probably the original trouble). The case was probably never put back together, and it just sat in this condition and was allowed to be bumped and banged into other things in the junk box until I came upon it in this sad state of repair. Was it worth repairing? Well, probably not, but then again, when do you run into a multimode handheld for portable operation? Had to give it a try.

Well, the radio was restored to service and the low power modification proved to be just what the doctor ordered to protect microwave converters and their expensive mixers. This was 7 years ago, and the old Santec is still functioning with its external audio gain pot and tape to hold the case and battery compartment together. Looks a little tired, but it still functions in a very trusty manner for USB, LSB, CW, and FM operations all on 2 meters at about 100 mW power output. Matter of fact, it still has the original 2 pF capacitor in place of the final transistor. As a finishing touch, I put a little RTV on to hold it in mid-air so it won't vibrate loose.

The ICOM IC-202 conversion

Back to the low power modification to the ICOM IC-202 transceiver. With the rig converted to LSB by changing the crystal, output power is limited by inserting a resistor in the DC power lead to the final transistor collector. Maintain normal DC power to all other circuits including the driver transistor. A 2 watt resistor of a value in the 75 to 80 ohms range will do the trick when using a NiCd battery pack. If using full 12 volts, this value will have to be trimmed to suit power requirements. This value resistor will reduce the DC voltage under load to the final amp transistor to about 4 volts.

In my IC-202, the plain vanilla rig, cut circuit board strap "W22" going to feedthrough capacitor C136, and place the resistor between these two points of connection. Stock operation is 12 volts on the collector and 3 watts CW/PEP SSB output, normally. After modification, with no drive there will be 12 volts on the collector, but when you speak into the mike and the transistor starts to draw current, the DC voltage will drop to about 4 volts, and power out will be near 100 mW. Verify the final power output setting you want for your application. I fudge a little in my setup and set power to a max of 125 mW, with maximum audio drive shouting into the mike for SSB operation. It's best to give it a test in a noisy atmosphere duplicating field conditions to check things out fully.

Now with a rig set to low power for converter use, there remains putting the rig on a specific frequency, and getting a crystal for the correct frequency is needed. With my IC-202 an early production model, the manual was not very clear on crystal parameters. This was a stumbling block for me originally, until I posted the question on a microwave Internet reflector, a great co-op information line to fellow microwavers. **Table 1** is one of several messages received covering the crystal information sought out on the Internet.

Peter's ICOM IC-202 manual was for the newer IC-202S, while my earlier model unit/manual was quite unspecific on the exact formulation to specify exact crystal specifications. My original manual covered schematic operation and basic information. The manual is quite exact, but minimal in crystal information to manufacture a crystal to specification. In any case, with help from the Internet (Peter G3PHO and others) and queries submitted to other amateur interest forums, I found the exact specification for the center frequency of operation.

The center frequency is the center of the 200 kHz full frequency range of operation per band segment. The IC-202 covers via a variable crystal "VXO" circuit to obtain 200 kHz of frequency coverage per crystal. So for 145.0 MHz to 145.2 MHz, the center frequency is 145.1 MHz.

Here is another message, from Jean-Paul F5AYE:

Subject: IC-202
From: Piller JPILLER@compuserve.com
To: WB6IGP Chuck clhough@pacbell.net

Hello, Chuck:

Do you remember me, Jean-Paul F5AYE? I met you last holidays at Kerry's house. I hope that all is well for you and Kerry. I have some information about xtal for IC-202. F is center frequency, ex.: 144.000 to 144.200, xtal F is 144.100. IF is 10.7 MHz, theoretical frequency for the xtal is: (F - 10.7)/9 but real frequency xtal is (F - 10.7)/9 + 0.02661 MHz.

Here in Europe it's the most used TRX for SHF transverter. Here I used 4 and 1 in spare!

Best 73 to you and Kerry,
F5AYE Jean-Paul

Just as Jean-Paul stated in the message above, it worked out to be exactly correct. Center frequency in MHz minus IF Freq. (10.7 MHz), divided by 9, plus .02661 MHz. This results in a 14.8 to 15.1 MHz crystal frequency. For my crystal for a center frequency of 145.1 MHz, the crystal frequency ordered was 14.959943 MHz in a pin crystal package for sockets (HC-25). I ordered my crystals from International Crystal Mfg. Co.'s (ICM) specification for the ICOM IC-202S per the formulation above. Cost of a new crystal was $11.45. International Crystal's order phone is (800) 123-4567.

Installation of both crystals worked perfectly following the crystal adjustment of the VXO inductor and variable capacitor to set band edges for proper dial

RE: ICOM IC-202 Xtals
TO: clhough@pacbell.net

The following crystal frequencies are taken from my IC-202 manual:

Center	Freq. Range	Type Crystal	Freq. Required (kHz)
144.100	144.0–144.2	HC18/U	14848.83
144.300	144.2–144.4	HC18/U	14871.06
144.50	144.4–144.6	HC25/U	14893.28
144.700	144.6–144.8	HC25/U	14915.50
144.900	144.8–145.0	HC25/U	14937.72
145.900	145.8–146.0	Hc25/U	15048.83

Quote from manual: "Installing certain combinations of crystals in the spare sockets can cause the output level to decrease ... as a result of absorption of some of the energy by the neighboring crystal." A slight realignment or even modification may be needed in some cases.

With the following center frequencies crystal in socket A, do not put anything in socket B:

144.5	144.9	145.9

With the following center frequencies crystal in socket B, do not put anything in socket A:

144.7	144.9	145.9

The following combinations work OK:

Range A	+ Range
144.5	144.7
144.5	144.9
144.9	144.7
145.9	144.7

In my own IC-202, I have the two ranges 144.0-200, 144.200-400, then Range A blank. Range B is 144.8-145.00. Since I only use the 202 to drive microwave transverters, this gives adequate coverage. I have reduced the output of mine to 100 mW for transverter drive use. Please feel free to spread this info around to others who need it.

Peter G3PHO

Table 1. G3PHO message.

The Digital Port

Jack Heller KB7NO
P.O. Box 1792
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[jheller@sierra.net]

You may recall last month's statement that I would give Jim Barber's ChromaSound program a try and let you know what I saw. What I saw is — it's terrific! You can download it and try it for yourself from the ChromaPIX Web site (see **Table 1**).

The program uses your 16-bit sound card with an audio cable from your receiver to the line-in jack on the card. That is all the external hardware there is: one cable. If you have been using ChromaPIX for SSTV, you should be set to go.

If you are like me, you have tinkered with every affordable interference reduction method available. You may have used filters so narrow for CW that they had to be turned off to tune for a new signal. I had one of those once upon a time and it showed me what an unstable receiver I was using back then. (Remember the days of band-spread? I had to keep one hand on the bandspread knob to keep pace with the drift!)

The ChromaSound program is an easy install. I installed it in Windows95™ just like it was "meant to fit in the place." Then I hunted around for instructions or a manual to print out. Not much available there. I found that there was some info on the Web site in the form of an FAQ file. It is a good idea to read that file and possibly print it. There is good information about getting up and running.

However, ChromaSound is the epitome of the intuitive program. You will find buttons to click on with your mouse and they do exactly what you expect them to do. There are tabs to bring up filter screens for SSB, RTTY, SSTV, and CW. Within those windows are preformatted filters for various modes, with standard audio widths as may apply for the mode.

If you feel you can improve on the results for your particular "ear," all you need do is click on the tabs in the displayed envelopes and move the shapes around to where they do the most good for you. After you are done tinkering, you can save the new format to its own button for future use.

The first test, SSB, was in my opinion the toughest. I have used about everything available on the planet to make readable audio out of the confusing hash that comes from my speaker. Up 'til now, the most successful has been the little Timewave box. I am not going to say this program beats that, but, in fairness, it is right up there.

I was showing my wife, who studies and teaches voice, the squiggles on the screen and how wonderfully the program erased so many of the unwanted squiggles. She was unimpressed. The demo was not how singing people relate to sound; it seemed the only logical approach to me. A different music emanates from my speakers than from hers.

On the other hand, she was impressed when I picked out an unintelligible signal and then pressed buttons and twisted appropriate knobs until the audio was relatively free from surrounding noises and, most importantly, was sending understandable speech into the room. This is, after all, the goal of transmitting and receiving the spoken word — that the thought processes must transfer from one mind to the other. This was happening regardless of the state of the aforementioned squiggles.

One of the hazards of accumulating the frugal ham's computer and accessories for the all-around whiz-bang digital ham shack is that some of the minor accessories tend to be resurrected from the junk box. In this case, I became woefully aware that the speakers attached to the output of the sound card are less than best quality.

I had to recall why that happened. When the sound card was installed several years ago, the furnished speakers had a well-deserved bad reputation. So bad were these speakers that within a few weeks they were replaced by some old-timers remaining from the days when AM radios were scavenged for parts.

The point of this is that when you expect to hear great quality from your computer sound card, that quality depends to a great extent on a good set of matching speakers. The other side of the coin is that even with these poorly matched speakers, the ChromaSound program delivered

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frequency calibration. It's always nice when something worked out well, and this was no exception. I am quite satisfied with the new crystals, and with restoration of this IC-202 SSB transceiver to a very useful tool for portable operation in conjunction with microwave converters.

While my IC-202 has some limitations, being only LSB in operation, it does have very nice VXO tuning (velvet smooth) dial operation, and this, along with the low power modifications for microwave converters, makes it a joy to use. 73 for now, Chuck WB6IGP.

Current Web Addresses

Source for:	Web address (URL)
HF serial modem plans + software	http://www.accessone.com/~tmayhan/
SV2AGW free Win95 programs	http://www.forthnet.gr/sv2agw/
BayCom — German site	http://www.baycom.de/
Pasokon SSTV programs & hardware	http://www.ultranet.com/~sstv/lite.html
New Mode — PSK31 — Free download	http://aintel.bi.ehu.es/psk31.html
Baycom 1.5 and Manual.zip in English	http://www.cs.wvu.edu/~acm/gopher/Software /baycom/
Source for BayPac BP-2M	http://www.tigertronics.com/
TNC to radio wiring help	http://prairie.lakes.com/~medcalf/ztx/wire/
ChromaPIX & ChromaSound DSP software	http://www.siliconpixels.com/
Timewave DSP & AEA products	http://www.timewave.com
International Visual Communication Association — a non-profit organization dedicated to SSTV	http://www.mindspring.com/~sstv/
XPWare — TNC software with sample download	http://www.goodnet.com/~gjohnson/
Auto tuner and other kits	http://www.ldgelectronics.com
TAPR — lots of info	www.tapr.org
Creative Services Software	www.cssincorp.com

***Table 1.** Handy URLs.*

excellent, understandable audio. I did, however, have to crank up the sound card volume to the speakers so I could make out the message.

Most of you who use your sound card for music have already installed good speakers and will not experience the minor irritations I have. I have a different approach toward music than the true aficionado. Perhaps that comes from listening to so many hard-to-copy signals: maybe it follows that music must be expected to sound that way also.

The second test was much easier. I tuned to some CW signals and turned on the filter, and they all disappeared except one. I could see it, hear it, copy it. It was such a stark difference, I clicked the filter on and off a couple of times to be sure I was listening to the signal I saw on the monitor.

I approached some of the other modes with a little hesitancy because I was worried about the stability of running a sound card program along with communications software. The reason was a crash I had experienced when I first attempted a screen shot and was bringing up a graphics program to process the file.

Rebooting the computer seemed to get rid of all the gremlins and I was able to get a file with a shot of the SSB signal envelope (which I chose not to use — I felt that the RTTY screen shot accompanying the article tells it all).

Finally, after much thought, I cabled the equipment to work as shown in the screen shot, and all went well with no crashes. I did keep the concurrently running programs to a minimum. That is my most common downfall. I minimize too many programs and leave them running, as there is often a need to go back to them throughout the day.

I did some of the experiments described later before this one and gained a new appreciation for the PK-232MBX. The ChromaSound DSP program and the '232 seemed like they were made for each other. I didn't pick out any lurking, below-the-noise-level DX signals, but I found that the output audio frequency from the sound card was correct for the input of the '232 and there was no problem with amplitude adjustments.

How the user works the program

The screen shot, as I mentioned, tells much of the story. There are tabs for formatted modes, SSB, CW, RTTY, and SSTV. The SSTV is under the tab labeled "Stock."

You may choose audio widths by selecting buttons on the various pages. There is an automatic notch that deletes the "tuner upper"-style signal and sends it packing so quickly you will think the guy turned off the rig. Also, there are noise limiter buttons that effectively reduce white noise in logical steps. The AGC button works as it should, and you will welcome it on occasion.

Roll your own

If you want to improve on the situation, make changes for a different mode, or just plain experiment, you will find little tabs on the display envelope. Click and drag to your heart's content. Each move results in an instant change in the filtering characteristic. When you find something you want, you can save it to its own button for future use.

In a nutshell, this is the setup: ChromaSound needs audio from the speaker output of the radio to the "Line in" jack on the sound card; you will have to set the level from time to time to get the correct drive for the system. That was easy: I had a cable from the first days of using ChromaPIX for SSTV.

If there was a trick to the output, it wasn't much of one other than having to assemble a new cable. The "Line out" on the card uses a small stereo plug and I needed an RCA plug at the other end. This allowed me to plug into a test port I had used once upon a time when testing the Timewave DSP unit. This port is switchable and allows the audio to feed either through the DSP sound card or directly to the '232.

The tuning indicator on the '232 guides the user to precise tuning, and it was immediately obvious that the ChromaSound was doing its job. With the radio tuned correctly and the signal within the prescribed envelope on the DSP screen, the '232 tuning indicator is very clean and the copy is as near perfect as RTTY gets. With the filter turned off, any hash or adjacent signals become apparent both in a disturbance on the tuning indicator and in deterioration of the copy.

What this says, of course, is that the two programs flew well together in the same computer and did their respective jobs with no crashes or recognizable problems of any sort. Makes my day when things work like I expect.

I also tuned some PACTOR signals. There are no preset screens for PACTOR, but I

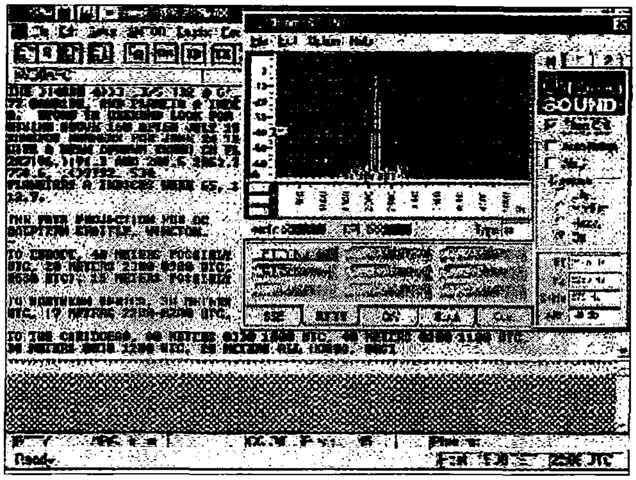


Photo A. This screen shot is ChromaSound in action filtering the RTTY propagation message from ARRL. The communication software, XPWare, is in the background, with the DSP program covering much of the upper right of the monitor. The filter continues to work if you click on the XPWare screen, which makes the entire screen available to the communications program. In this case, the audio signal is fed into the sound card where it is filtered, as evidenced by the clean signal display in the envelope. The output of the sound card is then fed to the PK-232MBX for demodulation, then to the serial port for the XPWare to decode and display the incoming message on the screen. See text for details of experiments and general tinkering with the many buttons.

simply used one of the SSB envelopes and changed its parameters to fit the need. The program works well there also. I wasn't linked, so the program was simply in the PACTOR "listen" mode. The point is that the filtered signal went to the '232 and was demodulated with no added problems.

Then, for the fun of it, I tuned a few CW signals while all this was working so well. That was also successful. I seldom use the '232 for CW, so it was interesting to note that the ChromaSound CW filter was so sharp that I had to turn it off so I could ease into the correct "curve" on the signal and get the '232 tuning indicator deflecting properly. Then I could turn on the filter, and this modem technology did its thing.

It continues to amaze me how CW can be decoded even though the "fist" may be less than perfect, if the equipment on the receiving end is up to it. I learned a long time ago, however, that if you want to work CW with this fancy stuff, you had better follow along and be sure the print on the screen is correct. As soon as you count on it, it ain't. That last line must have been spoken first by a famous ballplayer — then it trickled down to this not-so-famous ham.

I mentioned earlier that I had tried another experiment with the ChromaSound DSP. At first, I was leery of trying to get too much working in the same computer, so I rigged up a feed from the "Line out" of the sound card to the serial modem I built a while back from the design by K7SZL (see **Table 1**).

This was successful to a point. I was able to demodulate the RTTY signals and feed them to HamComm software in the laptop. This eventually worked, but it was necessary to adjust frequencies between the filter envelope in the DSP program and the frequency the HamComm program was looking for to gain success. It worked, but it is definitely not a contest setup.

I also attempted CW as well as SSTV through the modem into the laptop, but apparently was a little shy of audio power for those modes. The copy wasn't there with the CW mode in HamComm, and the Pasokon SSTV (see **Table 1**) program did not recognize the existence of a signal. Both modes responded fairly well without the filtering. Part of the problem was signal strength from the antenna. I could hear the signals by ear, but there just wasn't enough audio above the hash noise to decode with the filter operating.

What I like most is the visible spectrum display. You can instantly see and hear the effects of any changes you make, either by clicking a button or modifying the envelope in the display. It is like having a scope plugged in that always tells you what is happening.

One other item on my mind this month is the PSK31 activity. Unfortunately, I do more reading than operating, but there are plenty of glowing reports for this new mode. Having tried it, I heartily recommend it to everyone. It is easy to get started. Download it from the Internet (see **Table 1**), follow the instructions, and have fun. It is a great low-power activity.

To rest is to rust

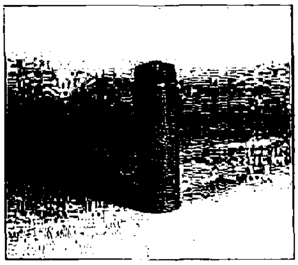
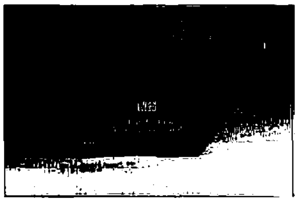
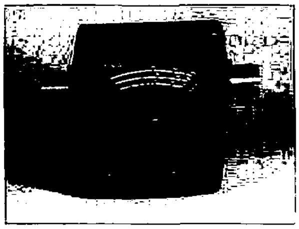
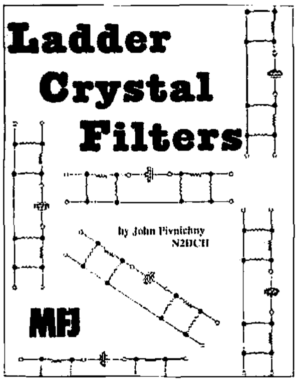
My wife found this saying, and it is one of her favorites. That is what keeps us going — along with adequate lube on the proper joints.

If you have questions or comments about this column, E-mail me at [jheller@sierra.net] and/or CompuServe [72130,1352]. I will gladly share what I know, or find a resource for you. For now, 73, Jack KB7NO.

Say You Saw It In *73*

Number 48 on your Feedback card

New Products

Mini News from MFJ

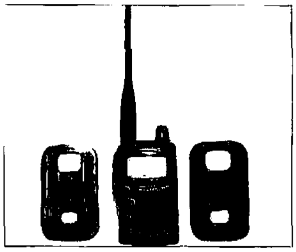
• MFJ's super Ni-MH "AA" batteries have twice the power of standard NiCds and can greatly extend the operating time of your electronic device. 1200 mAh, 1.2 V, and no detrimental memory effect as with NiCds. MFJ-92AA1, $2.99 each. MFJ-92AA10, $24.95, 10-pack.

• The MFJ-4125 Might-Lite™ is a great new streamlined-size 25 amp switching power supply for powering your HF transceiver, 2 meter/440 rig, accessories, and more. Super clean with less than 35 mV peak-to-peak ripple. $109.95.

• MFJ's new dual-band VHF/UHF SWR/power meter is perfect for mobile rigs and HTs. Covers 144 and 440, measuring in three power ranges: 15 W, 60 W, and 200 W. MFJ-844, $69.95.

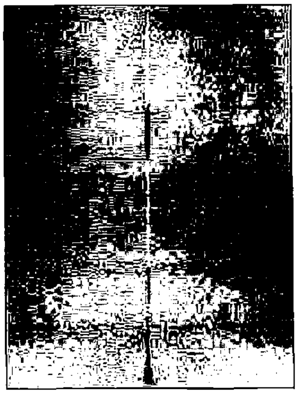
• *Ladder Crystal Filters*, by John Pivnichny N2DCH, is the only book devoted entirely to the design and construction of crystal filters using crystals of just one frequency. BASIC routines simplify the design process, allowing you to quickly build a high quality crystal filter. 136 pages, paperback. MFJ-3509, $14.95.

For further information about these or other MFJ products, contact MFJ Enterprises, P.O. Box 494, Mississippi State MS 39762; tel. (800)-647-8324; E-mail [mfj@mfjenterprises.com]; site [www.mfjenterprises.com].



The Radio Badge

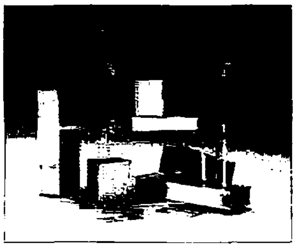
Now, the tiniest radios can go a step beyond the lapel microphone by being slid onto the Radio Badge by Cutting Edge. Two strong pins hold your radio firmly to your jacket, shirt, hat, or you name it. At only 3 inches by 1-3/4 inches, the RB is very sturdy and stable, and fits the majority of new radios such as the Yaesu VX-1R. $19.95. Cutting Edge Enterprises, 1803 Mission St., Ste. 546, Santa Cruz CA 95060; tel. (800) 206-0115; E-mail [cee@cruzio.com].



New Mobile Antenna by Comet

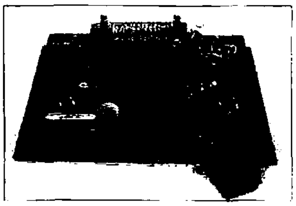
Comet Antenna has modified their CA-HV to resonate on the 70cm band. Initially, the CA-UHV is designed for operation on 6m/2m/70cm, and can be used as a tribander until HF operation is desired. It comes with HF tuning coils for 40/15/10m operation: 20m and 17m coils are available for purchase as well. You decide what band(s) you want to operate, and then add the appropriate coil(s) to the antenna, one vertically and the others horizontally. 6m/2m/70cm stays consistent regardless of which coils are added.

For further information, contact NCG Company, 1275 North Grove St., Anaheim CA 92806; tel. 714-630-4541; fax (714) 630-7024.



Sescom's LAB Box-ITs

Here's a great giveaway from Sescom. Get a free sample (pretty small, but hey! it's free!) of one of their LAB Box-IT enclosures just for the asking. This series consists of nine sizes with 25 optional pre-punched end panels for popular connectors. Easy to assemble: shipped flat; non-anodized/non-painted: economical; and great for making little test fixtures or small projects. Contact Sescom, Inc., 2100 Ward Dr. Henderson NV 89015-4249; tel. (702) 565-3400; fax (702) 565-4848; E-mail [sescom@sescom.com]. Offer expires December 20, 1999.



Navy Model ZR-1 Crystal Radio Set

The design philosophy behind this beautiful radio by Tippecanoe was not for all-out performance, but to maximize the beauty that can be inherent in a simple crystal set. Set in a frame of solid red oak, the base is made of 3/8-inch-thick Chinese Empress green marble. Hardware: brass. Catwhisker: phosphor bronze. End connectors: 24K gold-plated. You get the picture — even comes with a magnifying glass so that you old fogeys can see the whisker. Size: 8" D x 12" W x 7-1/4" H. Wt.: 7 lbs. For further details and price information, contact the Tippecanoe Radio Company, PO Box 321, Tippecanoe City OH 45371; tel. 937-667-9399.

No Smoking Stickers

At ten cents each postpaid, these 3-inch by 5-inch Day-Glo orange "No Smoking" peel-off stickers are great for the shack or your next hamfest or what-have-you. Consumer Information Center, 258-1/2 Main St., POB 190, Lansing IA 52151-0190.

HAMSATS

Number 50 on your Feedback card

Amateur Radio Via Satellites

Andy MacAllister W5ACM
14714 Knights Way Drive
Houston TX 77083-5640
[amac@icsi.net]

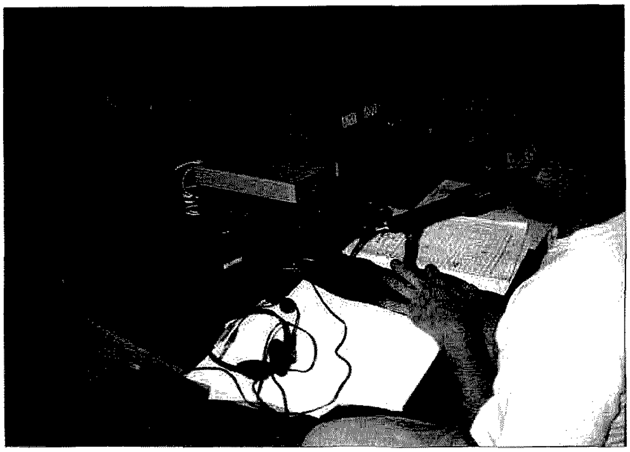


Photo B. Mike WA5TWT enjoyed some quality A-O-10 contacts while working the K5DX satellite station near Brenham, Texas.

Field Day offers an opportunity to test not only emergency preparedness communications, but also, for the satellite enthusiast, the challenge of making hamsat contacts from a remote location. Unlike normal shortwave operation, more preparation is needed for satellite work. The communications equipment and antennas must be checked for even minor problems since very often the received signals are weak and transponder loading is at its peak. If the Field Day site is far from home, orbital predictions must be recalculated for a different location, especially if beams are used.

Field Day 1999

Last year AMSAT-OSCAR-10 was surprisingly good, and this year was nearly the same, but this 16-year-old hamsat can be quite unpredictable since the onboard computer gave out over a decade ago. A-O-10 provided many voice and CW contacts for those who pursued it. A few stations discovered that they could even make contacts through A-O-10 with very simple portable yagis like the Arrow [http://hometown.aol.com/Arrow146/index.html]. A-O-10, with its high elliptical orbit, is still a great resource in the sky. And for those who are concerned about Y2K, A-O-10 not only doesn't care about the date, it doesn't even know. It is simply an uncontrolled, but functional mode "B" (70 cm up and two meters down) transponder in space.

The Fuji satellites, F-O-20 and F-O-29, were both in analog (voice and CW) mode for Field Day. Contacts were plentiful for those who were prepared for the exceptional Doppler shift associated with satellites with a UHF downlink. The 70-cm downlink signals can drift as much as 20 kHz in the course of an overhead pass. Satellite newcomers had problems keeping up.

The Russian RS hamsats did well. RS-13 provided contacts, as did RS-15. Usually RS-15 is very hard to use, but when receive conditions are good and the satellite's beacon is off, the results can be acceptable. For the Houston AMSAT Group, operating at the Texas DX Society site, several RS-15 mode "A" (2 meters up and 10 meters down) contacts were logged.

Operation via AMSAT-OSCAR-27 was, as expected, super crowded! This single-channel FM mode "J" (2 meters up and 70 cm down) repeater in the sky was working well even though it sounded like hundreds of stations were trying to access the satellite simultaneously. Perhaps the mass of signals is like that heard by shuttle astronauts when operating SAREX (the Shuttle Amateur Radio EXperiment). The result is that only a few contacts are made, usually by the stations with the biggest antennas and the strongest transmitters. It was wild, but at least it was entertaining. SUNSAT-OSCAR-35 was not available for Field Day, but if it had been, the results would have been similar.

The digital hamsats were doing reasonably well this year, but with KITSAT-OSCAR-23 gone, only two 9600-baud birds were on-line: UoSAT-OSCAR-22 and KITSAT-OSCAR-25. The relatively new Thailand satellite (TMSAT-OSCAR-31) was not available. With the recent addition of UoSAT-OSCAR-36 earlier this year, we expect Field Day 2000 to be better, and very different. While 9600 baud has become a standard digital hamsat speed, U-O-36 is capable of much more, up to 76.8 kbps (76,800 bits per second). Most access is expected to be at 38.4

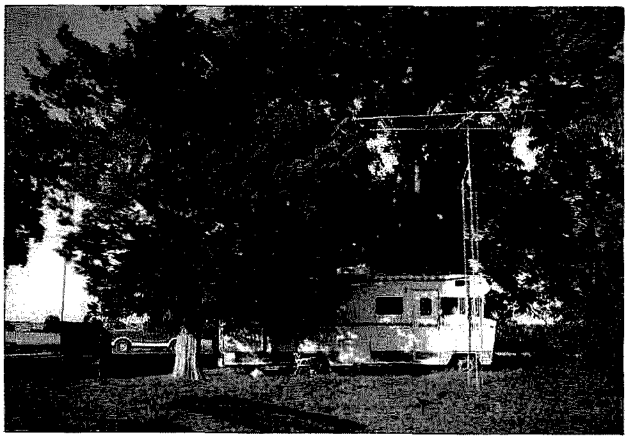


Photo A. The K5DX Field Day operation had a nice shaded hilltop spot for the satellite station.

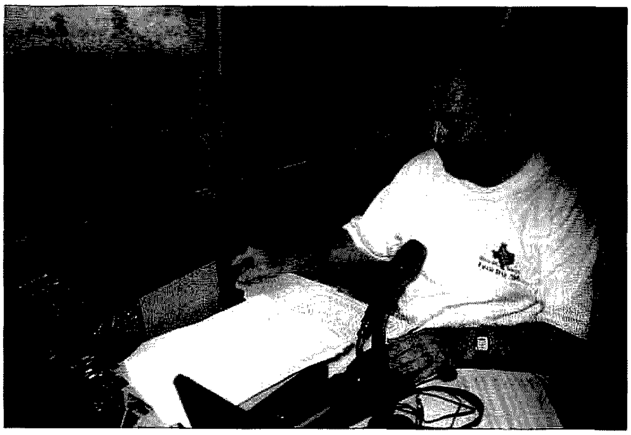


Photo C. Mike N5MT checks out the CW setup at the K5DX satellite station during Field Day 1999.

Photo D. The new Eagle Spitfire 454 10-meter HT is nearly identical in size with the much older Santec LS-202A 2-meter HT. Both are multimode radios with full band coverage.

kbps, but this will still require new gear for the home station, and field operation.

Portable toys

Wouldn't it be nice to work satellites with only a handie-talkie and a short antenna? It's been done. The single-channel FM transponders (crossband repeaters) on satellites like A-O-27 and S-O-35 can be worked using only a single dual-band HT when conditions are optimum and usage is light. But what about the other satellites that don't use FM, but rather support CW and SSB for multiple simultaneous users? There is no single unit that you can buy off the shelf for crossband, hand-held SSB or CW, but now there's something close.

Several years ago, Santec introduced a multimode two-meter HT called the LS-202A. It ran about a watt of FM or SSB. Frequency control was by thumbwheel switches and VXO (variable crystal oscillator) and RIT (receiver incremental tuning) knobs. Slide switches selected modes and other functions. A small analog meter was used for S-meter readings in receive and battery condition during transmit. It was a nice, if rather rare, radio. Santec also marketed a mobile docking amplifier to boost the power output to a bit over 30 watts. If you can find a used one that works, buy it, but be forewarned that some mechanical parts are proprietary and impossible to find.

The Santec LS-202A provided a great start for a two-unit mode "A" (two meters up and ten meters down) portable ground station. If SSB is not a necessity, quite a number of standard two-meter FM HTs can be used for mode "A" uplink work simply by connecting a code key into the external microphone connector and sending CW. Some HTs have excessive drift or chirp when used in this fashion. It's worth trying, though.

However, when the LS-202A came out, there was no comparable 10-meter HT on the market. Santec produced a number of HF handie-talkies under various names like Mizuho, Jim, and, in the U.S., AEA. The 10-meter version was called the MX-28S. The AEA model has the MX-28S name on top, but was sold as the AEA DX Handy. Although it was a 10-meter transceiver for CW and SSB, it was designed for use in the lower part of 10 meters. The radio required a new crystal and some retuning to use it in the satellite portion of the band between 29.3 and 29.5. To get on the air without reworking a radio that really wasn't intended for use at the high end of 10 meters, it was a lot easier to just use a 10-meter mobile rig or a small digital shortwave receiver.

The Eagle Spitfire 454

It sounds more like a good name for a CB rig, but the Eagle Spitfire 454 is a very recent, rather complex, all-mode (except CW) 10-meter handie-talkie. There have been a lot of new, unusual brand names showing up in the ham market in recent years. While most radios used to come from Japan, there are now rigs from all over the Far East. The Spitfire is custom manufactured for Copper Electronics of Louisville, Kentucky, in the Philippines.

Hams are always looking for all the features they can get in a radio for the lowest price. The Spitfire, as shipped, covers 28.0 to 29.7 MHz with AM, FM, LSB, and USB. It comes with an empty battery pack, a wall charger, a mobile power cable, a 9.5" base-loaded "duck" antenna, belt clip, hand strap, and a manual. The advertised price from Copper Electronics at [http://www.copper.com] is $179.99.

The basic design of the radio is derived from its CB (Citizens Band) ancestry. Construction and appearance is similar to Alinco, ADI, and Cherokee HTs. The owner's manual looks like the Japanese radio manuals of the '60s. It is full of strangely worded sentences, some with rather cryptic meaning. The abbreviation CB shows up at least twice in reference to this ham rig, but fortunately the radio is very easy to use, with only a few hints needed to get it running on any 10-meter frequency and mode.

The battery pack is designed to hold nine size-AA cells. Alkaline or NiCd batteries may be used. The radio will also work with some ADI NiCd battery packs and their clones. The included wall charger is intended for use with NiCds. The mobile power cable has a cigarette lighter plug on one end and is also intended for use only with NiCds in the battery pack.

Photo E. A close-up of the Eagle Spitfire 454 10-meter HT. Most controls are buttons on the front or side of the radio.

The antenna that comes with the radio is only good for very local operation, but the connector on the radio is a standard BNC type. Attaching a decent long whip, mobile antenna, or even dipole is easy. Some CB magnet-mount mobile antennas can be easily moved to the 10-meter band simply by removing one or two turns from the loading coil.

For the satellite operator, tuning the Spitfire takes some practice. Main tuning is accomplished using UP and DOWN buttons located just above the PTT (push-to-talk) switch on the side. The default tuning increment is 10 kHz. To directly address 1 kHz, 10 kHz, or 100

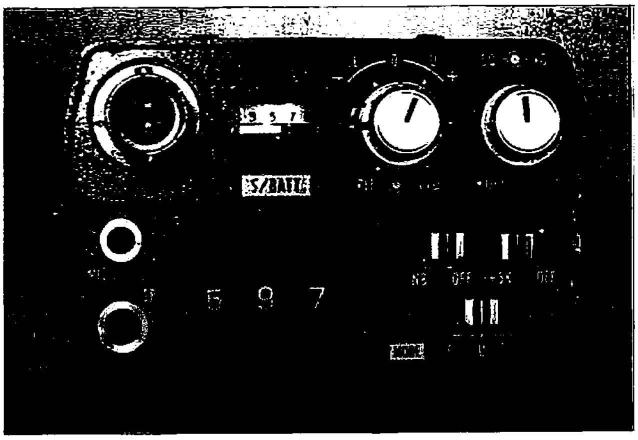


Photo F. The older 2-meter multimode Santec LS-202A HT had pots and switches on the top to control operation.

Number 52 on your Feedback card

On the Go

Mobile, Portable and Emergency Operation

Steve Nowak KE8YN/4
1011 Peacock Ave. NE
Palm Bay FL 32907-1371
[ke8yn@juno.com]

This month we continue the discussion of the Y2K phenomenon. For the past few months, we've been looking at some of the implications that we hams might face next January. If you're a new reader, we have been operating on the assumption that *if* some computers have a problem when the year turns to 2000, then it is wise to prepare. The other assumption that we have been accepting is that such problems would be manifest in ways similar to what we see with other emergencies. This could include power outages of some type or communications problems. Therefore, the worst we will do is practice skills we will need at some point in the future for the next hurricane, tornado, snowstorm, etc.

One interesting discussion that I've heard lately concerns our current trend in manufacturing called "Just In Time" inventory control. This requires that inventory is never carried in advance of its need. Instead, parts arrive at the time they are needed to be included in the manufacture of the final product. This procedure reduces the costs associated with buying product before it is needed, which is very attractive to the accounting and finance types. On the other hand, it is totally dependent upon the supply chain working almost perfectly. Indications are that there is no widespread emphasis on stocking up on required material in case the Y2K bug causes some burps in the rail or trucking industries or in the computers that track the orders and requirements at the plant. While this may not seriously affect us as communicators, it points out the fact that *if* there are problems associated with the Y2K event, some of them may be quite different from what people have encountered in the past. This may have less to do with the computer bug itself and more to do with changes in the way business conducts itself in this lean, mean, down-sized environment.

There are a few factors that may be different for us. One of the differences that may affect us in the next few disasters that we may be called upon to support involves the public perception of us. First, to most non-radio enthusiasts there is absolutely no difference between a ham and a CBer. In their eyes, we both use radios, we both put up ugly antennas, and we both mess up their TV. Second, the public is hungrier than ever for news, and we can expect a portion to use every means available, including listening to us, to keep up with changing events.

The first situation presents an important opportunity for us to educate the public. Most ham events, such as Field Day, do not truly catch the public's attention. We may get some publicity in the local paper or on the news, but the average citizen probably skips over those news stories since they may feel that they are not affected one way or the other by our efforts. To them, it is just a way for some guys with radios to have fun; while this is true, we all know there is more to it than just that.

During many real emergency situations, the public is not aware of the role we play. Part of this is because we are supporting such well-known disaster services as the local government, the Red Cross, the Salvation Army, and so forth. With the potential for Y2K problems, we have the opportunity to tell our fellow citizens what we will be doing if called upon to support in advance of the actual emergency. We have months to plan and execute our efforts to show our fellow citizens what we can and will do to help them. Talk

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kHz steps, a control on the front of the radio called STEP must be pressed to highlight, with a cursor, the digits to be incremented: 1, 10, or 100 kHz. When in this mode, the radio will not increment beyond the segment being tuned. If the "ones" digit is being shifted, the other digits will not be affected. It's like adjusting the time on a digital clock where changing the minutes setting will have no effect on the hours. To get beyond the selected range, the default tuning of 10 kHz must be reinstated by pressing the STEP key until the cursor quits blinking. While there is a "clarifier" that works on SSB and AM, it only tunes a few kHz either side of the displayed frequency. However, it does make all the difference when tracking Doppler shift on RS-13. After some practice with a few contacts via satellite, it gets easier to move the Spitfire around the satellite passband.

Receiver sensitivity is specified at 0.8 microvolts for 10 dB S/N (signal to noise). This is quite respectable. No preamp is needed, but the front end is prone to overload in locations with nearby HF transmitters, like on freeways around a lot of CB operators. Using headphones helps a lot for portable work.

Between satellite passes, the Spitfire does a very respectable job as a 10-meter transceiver. Power output on AM and FM is four watts. It is rated between six and seven watts on SSB. QRP enthusiasts are already working on a simple solution to make the rig transmit CW while in LSB or USB. For now, its use as a voice radio is quite satisfying.

For hams and other radio enthusiasts operating in foreign countries that allow amateur-radio rigs to be used in other services, there are modifications to the Spitfire that allow it to go substantially below the 10-meter ham band to almost 25 MHz. Information on activating this "export" mode can be found on the Internet at the URL [http://www.freeband.com/spitfire.html]. To modify the radio, a very small surface-mount chip resistor has to be removed from the circuit board on the back side of the PTT switch. Then the radio has to be reset by shorting a circuit pad to ground. To get to the export mode, a combination of keys are then pressed according to the instructions at [freeband.com]. Once in the export mode, the radio's operation changes dramatically with a "band" display and a "channel" display. To get back to ham-only operation, the combination of keys that were used to get to the export mode are now invoked again. Unless there is a really good reason to use the radio outside 10 meters, it is really a much more user-friendly radio to use in the native ham mode. Opening the radio to do the hardware modification also voids the warranty.

For less than $200, shipping included, the Eagle Spitfire 454 is an excellent answer for the portable mode "A" hamsat station, and with the sunspot number increasing, a fun way to get on 10 meters from remote locations without lugging around a mobile or base-station transceiver. Check out Copper Electronics' Web site at [http://www.copper.com]. They have some other rigs and devices you probably haven't seen before that are just now showing up on this side of the Pacific.

Number 53 on your Feedback card

QRP

Low Power Operation

Michael Bryce WB8VGE
SunLight Energy Systems
955 Manchester Ave. SW
North Lawrence OH 44666
[prosolar@sssnet.com]

Photo A. The audio amplifier kit from Ten-Tec contains only one small PC board and a bag of parts.

Well, the Dayton HamVention for 1999 is history. Everyone was blessed with great weather on all three days of the convention. Although I don't have the figures, the attendance seemed, at least to me, to be slightly higher than that of last year. Since the weather was so good, the flea market vendors did great! I sold almost 12 kW worth of solar panels during the three days of the convention.

Once again, the QRP ARCI held the Five Days in May technical forums. All the forums were sold out, with latecomers standing in the back. The annual banquet was held on Friday night, while Saturday night was for the vendors.

Wilderness Radio introduced their new SST CW transceivers. These rigs cover the CW portion of the three most popular QRP bands. Of course, they are monobanders: You have to take your pick of either 40, 30, or 20 meters.

The SST or Simple Superhet Transceivers are the lowest priced and smallest members of the Wilderness Radio lineup. They come as a kit, and since they are so simple, the kits require basically less than half the pieces parts used by other rigs.

Since they are superhet receivers, you don't need to worry about hearing both sides of the CW signal. They have a three-pole crystal filter and an effective AGC circuit. Audio output has been optimized for "walk-thing" headphones. There is no speaker, so phones are a must.

On the transmit side, you get two watts of VXO-controlled RF into a 50 ohm load. You also get QSK keying, transmit monitoring, and great stability, thanks once more to that VXO.

The kits come complete with an unfinished aluminum enclosure and a "no wire" construction.

The SST would make a great rig to take along to the outback. It has a standby current demand of about 15 mA in the receive mode.

Best of all, the SST is only $85, and that includes the case!

Dave Benson's Small Wonder Labs also introduced his newest rig. It's the DSW series transceiver. But this time around, Dave added a microprocessor to control the frequency and, at the same time, a CW output for the frequency! In a nutshell, it's based on his very popular monoband transceivers. You can get one for the 160, 80, 40, 30, and 20 meters.

The rig is very small, and Dave told me there are only four toroids to wind. There are two relatively large surface mount inductors, but the rest of the surface mount components have already been commercially installed.

And Dave added .100" locking headers to connect the outside world to the DSW transceiver. There's also a companion enclosure if you're not into bending metal. Oh, yes: The price is $90 for the kit and $35 for the enclosure. You can order your own by dropping Dave a note at: Small Wonder Labs, 80

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about a marketing opportunity — this is one in a lifetime!

Compare the potential "Just In Time" issue above with what hams are doing to prepare for any emergency and this one in particular. We are proactive by regularly planning and preparing for emergency situations as opposed to waiting for an event to occur. We routinely prepare before each storm season, but few potential disasters have caught the public's attention the way Y2K has. As news reporters are looking for Y2K story ideas, why not present what we are doing to prepare? This is an excellent time to point out that we are licensed by the federal government. One of our primary purposes specifically stated in the law is to provide emergency communications! What other groups are so specifically tasked by the federal government? And, oh, by the way, this is one of the reasons that we are permitted to install large antennas — so that in the event of an emergency, we can communicate effectively. I strongly recommend that we do not pass up this opportunity to blow our own horn.

The second issue fits in with the first. People have always been hungry for news, which is why there are now a number of all-news stations on cable. The commercial operators have seized this opportunity to improve their own commercial success. How many "headlines" presented during prime-time television present any real information compared to the number that are teasers designed strictly to entice people to tune in later. ("Six people died violently! We'll tell you who at eleven ...") News networks frequently broadcast conjecture, supposition, and theory to fill air time when the facts are not yet known. On the other hand, if we hams are providing communications service in any disaster, we are often the first to know what's going on. Skywarn is a prime example. Who is it who reports the hail, wind damage, etc., to the National Weather Service? We do, of course, and the information is passed along to the news media well after we are aware of it.

Some people already use scanners to track various public service transmissions and routinely monitor our frequencies as well. If we publicize our role in disaster recovery, more people may decide to listen in to our transmissions. It may even be wise to include in press releases or news stories that these transmissions can be heard, and even include the frequencies. This may be helpful in demonstrating our importance to the community, but will also make it even more important to ensure that we operate in a professional and competent manner. The advantage is that if we present ourselves in a well-trained and professional manner before the end of the year — and do a good job on the air — we may be able to build a greater level of support for our hobby.

Number 54 on your Feedback card

HOMING IN

Radio Direction Finding

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Fullerton CA 92837
[Homingin@aol.com]
[http://www.homingin.com]

Photo A. Dick Arnett WB4SUV has a well-equipped mobile T-hunt setup including a doppler and a storage-scope display.

Dayton does DF

Remember the New Year's resolutions that you made as 1999 began? Have you fulfilled them? Perhaps you decided to try something new in ham radio, such as hidden transmitter hunting (also called T-hunting and foxhunting). I resolved to make the trip from California to Dayton for a first try at the Hamvention.

Until this year, I didn't have a good reason to go. Flea market? I can easily drive to three big ham radio swap meets every month. Talks and exhibits? Our annual Southwestern Division bash (HamCon) is nothing to sneeze at. It always has good forums, plus great transmitter hunts with lots of prizes. So why travel to a hamfest almost two thousand miles away?

Last October, I got E-mail from Jim Elmore KC8FQY of West Chester, OH. He was helping to plan the biggest and best radio direction finding (RDF) activities for the 1999 Hamvention. Jim was teaming with Dick Arnett WB4SUV of Erlanger KY and Bob Frey WA6EZV of Cincinnati to put on both the Foxhunt Forum and a whiz-bang foxhunt. He wouldn't take no for an answer.

I had been in E-mail contact with KC8FQY since he began T-hunting in early 1997. Jim has worked very hard to learn the secrets of RDF, detailing his experiences in the "Confessions of a T-Hunter" pages of his Web site. WB4SUV and WA6EZV (**Photos A and B**) are serious RDF experimenters who are always

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Photo B. The completed audio amplifier sits on top of the Drake SW8 receiver.

East Robbins Ave., Newington CT 06111. You can also contact Dave via E-mail at: [bensondj@aol.com].

I have plans for this rig, and I'll share them with you by the Dayton HamVention 2000!

While I held on to most of my money, I did get one kit from Ten-Tec. It's a Utility Audio Amplifier, number 1252. The 1252 is a rugged portable audio amplifier kit that offers both high and low impedance inputs. The heart of the kit is the Signetics TDA2611A power audio IC. It can easily drive the internal speaker to 1.5 watts of pure audio. In fact, Ten-Tec uses this very same audio chip in many of their rigs. Most of the QRP rigs I have built use the popular LM386 audio amplifier. Its output on a good day is about 200-400 mW of audio.

The 1252 has a preamplifier for driving low impedance inputs. You can switch this preamplifier in or out of the circuit if you use a high impedance input. An internal trimmer allows you to set the gain coming in from the high impedance input.

I also like the way the 1252 handles audio input signals. You have your choice of either an RCA or 1/8" mono input jacks.

Everything comes together in a painted and silk-screened box. You also have two choices to power the 1252: Use the internal 8 AA batteries or an external 12 volt DC source. A steering diode selects the external power supply if the input voltage is greater than that of the internal battery pack. I have not tried to use the amplifier with an AC-powered power supply.

Assembly of the 1252 is rather straightforward. Everything (except for the switches) is on one small single-sided PC board. Assembly consists of stuffing the board and wiring up the switches. Bear in mind, there are a lot of wires going in and out of the PC board to the switches.

All and all, the 1252 was a snap to assemble. Now that it's done, what can it do for you?

Well, Radio Shack sells an amplifier in a box. It's based on the LM386 and comes with a small speaker built-in. It works nice, but leaves a lot to be desired. The 1252, on the other hand, is industrial strength.

If you have experimented with a direct conversion receiver, then you know the importance of a good, stable audio chain. You can work on the RF sections, as the audio section is easily handled by the 1252.

The 1252 would make a great signal tracer, too. A .047 cap to isolate the 1252 from DC voltage in the test rig, and you'll easily be able to track down the problem.

Ten-Tec included a "listening to energy" booklet and some extra pieces parts to play with. One is an induction pickup coil for amplifying telephone conversations. I use the pickup coil and the 1252 when I'm put on hold waiting for tech support from Microsoft. That way, I can go about doing what I need to do, while I listen to the voice on hold message telling me the all service technicians are busy. When it's my turn, I turn off the amplifier and pick up the phone. It's a cheap man's version of a speakerphone.

All and all, I like the 1252. It's going to be on my workbench for a very long time. It's about $45 and well worth the price. Every QRP operator should have one in his or her shack.

If things work as I have planned, I'll have some real-life QRP camping tips for next time. Keep tuned! 73

***Photo B.** Bob Frey WA6EZV, an OK-KY-IN foxhunter and one of the hunt organizers, shows off his Roanoke Doppler antenna set.*

***Photo D.** WA6EZV needed a bullhorn to get the attention of the crowd of foxhunters before the hunt started.*

ready to track down RF sources for fun and public service.

All three are members of OH-KY-IN Foxhunters, a very active group that draws RDFers from a three-state area to monthly T-hunts that usually start in Cincinnati. These intrepid folks do it all year long, and they like to hunt on foot as well as in their cars. As an example, the temperature was only 18 degrees Fahrenheit when the February hunt began. WA6EZV had put a transmitter in a park on the east side of the city. That T kept the hunters busy for only about a half hour, but they knew Bob had more in store for them.

Sure enough, there were four more foxboxes within the park, all on different frequencies. To make sure that the four hunting teams didn't play "follow the leader," Bob told them that each team had to search for his QRP transmitters in a unique order. The first team was directed to find them 1-2-3-4, the next 2-3-4-1, and so forth. One fox was in a bush, another between the tires of a parked truck, the third inside some construction pipe, and the last was deep in a snowbank.

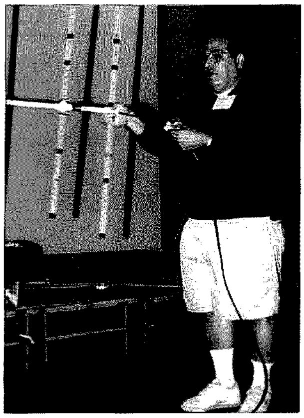

***Photo C.** Tape-measure beams are very popular for on-foot foxhunting. Joe Leggio WB2HOL shows his three-element version at the Dayton Foxhunt Forum.*

WB4SUV's team won that February event, so Dick had a chance to get even in March. Winter was still around at that time, so he made the hunters sniff in the snow once again. But first, they had to track down his main transmitter. It was at a nature preserve in Delhi, Ohio. Its dipole antenna was in a tree along the bank of the Ohio River. Three teams tried to approach the preserve from the Kentucky side and had a lot of backtracking to do. They were probably victims of the "river effect," which occurs when VHF signals reflect from multiple locations along a riverbank and give ambiguous bearings.

RDF extravaganza

For the 1999 Hamvention Foxhunting Forum, Jim, Dick, and Bob envisioned a 3-ring circus of RDF. Dale Hunt WB6BYU of Portland, Oregon, would relate his experiences at the 1998 ARDF World Championships in Hungary (see "Homing In" for January 1999). He would be assisted by Marvin Johnston KE6HTS of Santa Barbara, California, who was also part of the USA's traveling team.

Joe Leggio WB2HOL (**Photo C**) would do a show-and-tell of the many RDF projects he has built in the past four years, including foxboxes and rugged directional antennas. These projects are documented on WB2HOL's Web site. It would be my job to relate the adventure and intrigue of mobile T-hunting, southern California–style. I figured that about ten dozen slides would do it.

Our OH-KY-IN hosts were invaluable at teaching us first-timers the appropriate survival skills for Dayton. The worst part was the parking, which is a l-o-n-g way from the arena. Fortunately, our hosts had passes and could deliver all of our paraphernalia directly up to the building. But watching a few tortured hams trying to carry their prize boat anchor purchases from the flea market all the way to their vehicles convinced me that next time, I should bring a wagon. For that muddy dirt parking lot, it will

Continued on page 56

Photo E. Yep, it's really in there. Richard Lorenzen WAØAKG holds a log transmitter, complete with numbered tag.

HOMING IN

continued from page 55

need big wheels. Maybe a moon rover?

The Dayton flea market lived up to its reputation. Easily bigger than all three southern California monthly swap meets put together, it was far too much to cover in our limited available time. But we did manage to check out the booths of some suppliers of RDF stuff, including Dave Peleaz AH2AR and Fred Reimers KF9GX.

The only hitch in the Foxhunting Forum was a last-minute time change from 1000 to 0815 hours on Saturday.

Photo F. First-prize winner was Dale Hunt WB6BYU of Portland, Oregon, who was the only one to find 11 of the 16 transmitters.

Because it began too early for many attendees who were still in line trying to get their tickets, the room filled up more slowly than predicted. By the end, though, there was a big crowd listening to WA6EZV wrap up the forum by promoting the Hamvention foxhunt, which would be held that afternoon.

Exercise, fun, and prizes

I was glad to find out that this year's foxhunt was not for mobiles. The thought of putting RDF gear in a rental car did not appeal, nor did the prospect of competing against OH-KY-IN foxhunters on their home streets and highways. This Dayton foxhunt was all on foot, but it didn't demand Olympian abilities (**Photo D**).

The hunt area, across a highway from the convention site, included the exterior of a school building, a parking lot, and a field with a baseball diamond and large water tower. Each person was handed a card with individual frequencies of the 16 transmitters on this hunt. (I think all 16 were out there, but there were a couple that I never heard.) The goal was to find the most foxes in a 90-minute period.

Foxes could be found in any order. They were concealed inside sidewalk cracks, logs, old tire carcasses, and so forth (**Photo E**). A small black-and-gold label with a unique 3-digit number was next to each one, to be written onto the frequency card. There were no decoy labels. (Well, none that I encountered, anyway.)

Transmission times ranged from a few seconds each minute to continuous. Since all foxes were on separate frequencies, there was no problem of them QRMing each other. However, hunters had to program 16 frequencies into their HTs and scanners (32 if they used offset attenuation) for best efficiency.

Even busier were users of single-turndial ARDF sets such as the Russian Altai or Australian Ron Graham units (See "Homing In" for December

Photo G. Paul Gruettner WB9ODQ won second place and took home a new transceiver, along with the congratulations of WB4SUV and KC8FQY.

1997). Their owners were constantly twisting the tuning knob. Users of 1 MHz offset attenuators had their own problems, as some of the fox frequencies were spaced 1 MHz apart. What's more, there were plenty of simplex QSOs taking place in the Hamvention arena a quarter mile away. Many fox signals were so weak that you had to be within 50 feet to pick them up at all, even with a beam antenna.

Teaming and collaboration on the course was permitted, but there could be only two hunters on a team at most. A "one RDF antenna per team" rule was also in effect. This kept team members from hunting independently and then pooling their scores. But it allowed a hunter to have extra eyes to spot the tiny tags. I took advantage of this rule by inviting Richard Lorenzen WAØAKG to come along with me.

When my directional and signal strength indications told me I was very close to a fox, I would discreetly back away and let Richard surreptitiously uncover the tag and get the number. This made it less likely that the exact locations would be given away to someone watching me. In retrospect, it would have been smart to send him out running with just an HT, to see if he could catch a whiff of some of the elusive very-QRP foxes. Then I could have finished tracking them down with the RDF gear.

After the 90 minutes of scurrying were over, it was time to tally the results. Winners were determined first by number of foxes found and second by speed. To judge speed and to avoid ties, each hunter had been encouraged to have his card checked regularly by course officials, who would mark the

Photo H. Lars Nordgren SMØOY is a champion foxhunter from Stockholm who couldn't miss the opportunity to go foxhunting at Dayton. Lars was one of the hosts of the 1994 ARDF World Championships in Sweden.

Number 57 on your Feedback card

Calendar

Listings are free of charge as space permits. Please send us your Calendar Event two months in advance of the issue you want it to appear in. For example, if you want it to appear in the December issue, we should receive it by October 31. Provide a clear, concise summary of the essential details about your Calendar Event.

SEP 18

LINCOLN, ME The Bagley ARC of north central Maine will hold their 7th Hamfest at the Ella Burr School in Lincoln ME on Sep. 18th. VE exams will be held in the school complex. For further details, call Hamfest Committee Chairman *Max Soucia at (207) 564-8943; or Sylvia Cockburn N1JNR, (207) 732-5185, Fax (207) 732-4211.*

SEP 18–19

EL PASO, TX The 1999 El Paso Southwest International Hamfiesta will be located at the Ysleta Independent Cultural Arts Center, 9600 Sims, El Paso TX. It will be open 8 a.m.–5 p.m. Sep. 18th, and 9 a.m.–1 p.m. Sep. 19th. Talk-in on 146.88. Please contact *Craig A. Lyles KC7UXM, (915) 821-7501.*

SEP 24–26

LANCASTER, NH The United Way of Northern NH will sponsor the Lancaster Super Moose Festival Hamfest and Computer Flea Market. This event will be held at the Lancaster Fairgrounds, Rte. 3, Lancaster NH. More than 200 hookups in the selling area. Miles of tailgating space. Large commercial vendor space. On-site parking. $25 per night for camping space with hookup. General admission $3 per day. Vendor fees for the weekend (tables not provided) include one weekend admission: (A) $20 outside, no electricity; (B) $30 outside, electricity; (C) $50 for inside buildings. Make check payable to United Way of Northern NH, and mail to *Lancaster Super Moose Festival, P.O. Box 614, Berlin NH 03570. Russ N1YZE is your contact person. Tel. (603) 752-3343; E-mail [unitedway@ncia.net]. Fax (707) 202-1871.*

PHOENIX, AZ The ARRL and TAPR 18th Annual Digital Communications Conference will take place at the Holiday Inn Select Airport. Special DCC room rates are $69/single and $79/double per night. When making reservations with the hotel be sure to indicate you are attending the ARRL and TAPR DCC in order to get the discount. Book your room ahead of time. The hotel provides transportation to and from the Phoenix Sky Harbor International Airport. Please arrange transportation needs ahead of time: Holiday Inn Select Airport (conference hotel), 4300 E Washington, Phoenix AZ 85034. Tel. (602) 273-7778; Fax (602) 286-1109. Pre-registration, before Sep. 1st, $42. Registration after Sep. 1st or at the door, $47. Saturday Evening Dinner, $22. The 3rd Annual APRS National Symposium, Fri., 1 p.m.–7 p.m., $25. Technical Seminar on HDTV, Fri., 5 p.m.–7 p.m., $15. A PIC Design, Development, and Programming Seminar will be conducted by the TAPR PIC Development Team, Sun., 8:30 a.m.–2 p.m., $20. Full info on the conference and on lodging can be obtained by contacting *Tucson Amateur Packet Radio, (940) 383-0000; Fax. (940) 566-2544. E-mail [tapr@tapr.org].* The Web site is *[www.tapr.org].*

SEP 25

DAYTONA BEACH, FL The ERARA and DBARA clubs have again joined together to bring you the 3rd annual Daytona Beach Hamfest and Computer Show, Sat., Sep. 25th, 9 a.m.–5 p.m., at the Embry Riddle Aeronautical Univ. campus on Clyde Morris Blvd., just 1 mile south of International Speedway. Talk-in on 147.150(+600), starting at 7 a.m. Doors open 9 a.m. sharp. Lunch will be provided at modest cost by Embry-Riddle student organizations. Admission is $5. For advance tickets send a check or money order along with an SASE to ERAU C/O Student Activities, 600 S. Clyde Morris Blvd., Daytona Beach FL 32114, before Sep. 10th. Handicap parking is provided. 6-ft. tables with power are $7 for one, $6 for each additional. 5-ft. tables are $6 for one table, $5 for each additional. All tables have power connections. Tailgate sites in the paved parking lot are $3, no power. VE exams for all classes. There will be a hidden transmitter hunt (with a $50 cash prize) at 4 p.m. You must have a paid admission ticket and sign up for the hunt before 4 p.m. to be eligible for the prize. Contact *DBARA-Hamfest, P.O. Box 9852, Daytona Beach FL 32120; or E-mail [munseyj@mindspring.com].* Web pages are at *[http://www.america.com/~dbara/]* and *[http://www.db.erau.edu/campus/student/club/erara].*

HORSEHEADS, NY The Amateur Radio Assn. of the Southern Tier will present its 24th Annual Elmira International Hamfest-Computerfest on Sat., Sep. 25th, at the Chemung County Fairgrounds in Horseheads. Talk-in will be on 147.360, with an alternate frequency of 146.700 (in case the primary frequency is down). There

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number of foxes found so far and the exact time. If two or more individuals/teams had the same number of foxes at the end, an earlier check time would place higher in the standings.

None of the participants found all 16 foxes. Winner of the hunt and a new voice/packet transceiver was WB6BYU (**Photo F**), who was the only one to find 11 of them. Dale, hunting alone, used the same VK4BRG ARDF receiver/antenna set that he took to the ARDF World Championships in Hungary last year.

Second place was Paul Gruettner WB9ODQ (**Photo G**) of Nashville, assisted by Larry Christianson WB9SDD. Paul took home a new 6-meter mobile rig for his efforts. He later wrote, "We got off to a slow start. The first transmitter signal directed us straight towards the water tower. Upon getting there, we discovered it must have been a reflection because the signal then pointed back towards the school building. After digging through the bushes for a few more minutes, we found our first transmitter, against the school building, behind some hedges. Twenty minutes had passed. After that, things started to improve and our time between finding transmitters started to shorten. Locations of ones we found included the base of a street light, a crack between a concrete walk and a building, and inside a small log amidst a wood pile."

Three entrants found ten foxes and three (including yours truly) found nine. I used an ICOM R10 scanner and active attenuator as described in "Homing In" for May 1998. Its 4 MHz offset was a big help in minimizing QRM from the hundreds of hams on the air nearby during the hunt. Coming all the way from Sweden was Lars Nordgren SMØOY (**Photo H**), who found five. At the other extreme, a couple of hunters found only one fox, but they said they still had a fine time.

I'm glad I kept this New Year's resolution. It was great to spend three days with a bunch of friendly midwest hams who know how to have fun with RDF. No matter where you are, your RDF activities are of interest to *73*'s readers. Send your foxhunt stories and photos to the postal and E-mail addresses at the beginning of this article. All of the Web sites mentioned above are accessible by link from the "Homing In" Web site.

will be dealer displays of new equipment, and a large flea market area. Breakfast and lunch will be served on the premises. Admission is $4 for advance tickets, $5 at the gate. The event will run 6 a.m.–3 p.m., with VE exams starting at 9 a.m. For VE exam info, contact *John at (607) 565-4020.* Dealers, please call *Gary at (607) 739-0134.* For tickets, call *Dave at (607) 589-7495.*

SEP 26

BOWIE, MD The Foundation for Amateur Radio (FAR) will sponsor the 42nd annual F.A.R.Fest amateur radio hamfest on Sun., Sep. 26th, at Prince Georges Stadium, 1/4 mile south of the junction of US-50 on US-301 in Bowie (between Washington DC and Annapolis MD). Directions: From points north, take I-95 south to the Baltimore Beltway (I-695) to Exit 4 (I-97 South) toward Annapolis. On I-97 South, take Exit 7 (Route 3 South—Bowie/ Odenton). Take Route 3 for approx. 11 miles. After passing under the Route 50 overpass, proceed to second traffic light and turn left into Stadium Drive. Note: Route 3 changes to Route 301 after you pass under Route 50. From points south, take I-95 North to Exit 104 (Route 301 North). Take 301 North past Upper Marlboro. Go through the traffic light at the Route 197 intersection (Rip's Country Inn will be on the right). At the next traffic light, turn right into Stadium Drive. From points east, take Route 50 West to Exit 13A (Route 301 South). At the second traffic light, turn left into Stadium Drive. From points West: From I-70 East, follow directions coming from points north. From Washington DC or the Capital Beltway: From DC, take New York Ave. to Route 50 East, or the Capital Beltway, Exit 19A (Route 50 East). Take Route 50 to Exit 11 (Route 197). Go south on Route 197 for approx. 1.5 miles to Route 301. Turn left onto Route 301 and remain in the right lane. Turn right at first traffic light into Stadium Drive. This hamfest location has a paved area that will accommodate over 700 tailgaters. Vendors and other sellers will be able to set up under the canopy of the stadium concourse. General admission $5 at the gate. $10 for tailgating (admission ticket required). Vendors and other exhibitors should contact Marry Morris N4TCI, [radio@hotmail.com] or (703) 971-3905. Special Event Station W3PRL-AM will be on display. For general info on F.A.R.Fest '99, contact *Al Brown KZ3AB, [amateurradio@hotmail.com] or (301) 490-3188.* Talk-in on 146.520 MHz and 147.105 MHz.

YONKERS, NY The Metro 70 CM Network will host a Giant Electronic Flea Market Sep. 26th at Lincoln High School, Kneeland Ave., Yonkers NY, 9 a.m.–3 p.m., rain or shine. Free parking. No tailgating. Indoor flea market only. Donation $6, kids under 12 free. Vendors, for advance table reservations, the 1st table is $19, $15 each additional table All tables 30 inches x 5 ft., or bring your own tables at $14 for a 6- ft.-long space. Tables are $25 each at the door, or $20 for a 6-ft. space. Full payment is due with registration. Table setups are at 7 a.m. For registration, call *Otto Supliski WB2SLQ, (914) 969-1053.* Talk-in on 440.425 MHz PL 156.7; 223.760 MHz PL 67.0; 146.910 MHz; and 443.350 MHz PL 156.7. Mail paid reservations to *Metro 70 CM Network, 53 Hayward St., Yonkers NY 10704.*

OCT 1–2

SPRINGDALE, AR The NWAARC Hamfest '99 will be held at Jones Center for Families, 922 E. Emma Ave. (north of the airport)., Fri., Oct. 1st, 7 p.m.–9 p.m.; Sat., Oct. 2nd, 8 a.m.–2 p.m. Setup both days. To pre-register for VE exams, contact *Doug MacDonald W4FH, 684 Cliffside Dr., Fayetteville AR 72701-3813; tel. (501) 443-3359.* Admission $5. Tables $6. Tailgate $4. Free parking. For reservations or general info, contact *Northwest Arkansas ARC, P.O. Box 24, Farmington AR 72730; or Clarence Morrow KC5UEW, Chairman, P.O. Box 264, Rogers AR 72757-0264. Tel. (501) 631-9231.*

OCT 1–3

LONG BEACH, CA The ARRL Southwestern Div. Convention will be held aboard the Queen Mary Ocean Liner Hotel, Pier J in Long Beach CA. It is located at the south tip of the Long Beach Freeway and is only a short 1/2 hour drive from Los Angeles Internat'l. Airport. Banquet tickets are limited and you are advised to reserve seats early. For more info, please write to *HAMCOM, P.O. Box 17864, Long Beach CA 90807,* or visit them on the Web at *[http://www.qsl.net/arrlsw/hamcon].* The featured banquet speaker will be W. Riley Hollingsworth K4ZDH, FCC Legal Advisor for Enforcement. He will speak Sat. evening, October 2nd. Film/ Television producer Dave Bell W6AQ will be Master of Ceremonies for the event. In addition to speaking at the banquet, Hollingsworth will also host an open FCC Forum earlier in the day.

OCT 2

POMPEY HILLS, NY The Radio Amateurs of Greater Syracuse will hold the 43rd "RAGS 1999 Hamfest" at the Pompey Hills Fire Dept., just off Route 20, Sat., Oct. 2nd, 8 a.m.–2 p.m. Talk-in on 147.90/.30. Admission $5, 16 and older. Outside flea market spaces $3. Indoor tables *must* be reserved, $10 plus admission ticket. Mail payment to *RAGS, Box 88, Liverpool NY 13088. Tel. (315) 469-0590.* 8-ft. space, $5 (bring your own table). Friday setup 4 p.m.–9 p.m., Saturday setup 6 a.m.–8 a.m. Tailgaters, $3 10 x 20 ft. space, plus admission. Visit the Web site at *[www.pagesz.net/~rags].* For VE exams, pre-register by Sep. 24th. Send name, address, phone number, test(s) you are applying for, to *Exams, Box 15144, Syracuse NY 13215.* Breakfast and lunch served 7 a.m.–1:30 p.m. by the Pompey Hills Fire Dept.

WILLOW GROVE, PA From 9 a.m. until 9 p.m. the Mt. Airy VHF Radio Club will present the 1999 Mid-Atlantic States VHF Conference at the Hampton Inn, 1500 Easton Rd., Willow Grove PA (Rte. 611, 1/4 mile below the Willow Grove Exit #27 of the PA Tumpike). Call (215) 659-3535 for room reservations. Conference registration is $24 per person at the door, which includes an admission ticket for HAMARAMA, being held the following day. Contact *John Sortor KB3XG, 1214 N Trooper Rd., Norristown PA 19403. E-mail [johnkb3xg@aol.com]. Tel. (610) 584-2489.* See the Pack Rat Web site at *[http://www.ij.net/packrats]* for location maps and additional info.

OCT 3

WRIGHTSTOWN, PA The Mt. Airy VHF Radio Club (Packrats) will hold its annual HAMARAMA on Sun., Oct. 3rd, at the Middletown Grange Fairgrounds, Penns Park Rd. (between Rtes. 232 and 413), Wrightstown PA. Open to the public at 7 a.m. for a $5 donation. Doors open to vendors at 6 a.m. for outdoor tailgating spaces for $10 each, plus general admission charge. Indoor spaces with 8-ft. tables available at $15 each by pre-registration only. Sellers of new and used amateur radio equipment, electronic components and computer hardware/software vendors are invited to participate. Talk-in on 146.52 simplex. For more info, contact *Mark Schreiner NK8Q, 662 Cafferty Rd., Ottsville PA 18942; E-mail [nk8q@amsat.org]; Tel. (215) 847-2285; or Bob Minch N3XEM, E-mail [raminch@bellatlantic.net]; Tel. (215) 822-0779.*

OCT 8–11

SAN DIEGO, CA The 1999 AMSAT-NA Annual Meeting and Space Symposium will be at the Hanalei Hotel in the heart of San Diego's Mission Valley, Oct. 8th, 9th, 10th, and 11th. Hotel reservations can be made by calling 1-800-882-0858. Be sure to mention **AMSAT** to receive the $85 per night discounted group rate. This rate is available for rooms reserved between Oct. 4th and Oct. 12th. The local contact for the AMSAT event is *Duane Naugle KO6BT, [ko6bt@amsat.org].* There are many nearby attractions for entertainment and recreation, including the San Diego Zoo, [www.sandiegozoo.org], and Disneyland [disney.go.com/Disneyland/index.html].

OCT 10

LIMA, OH The Northwest Ohio ARC will host the Lima Hamfest & Computer Show, Oct. 10th, 8 a.m.–2 p.m., at the Allen County Fairgrounds in Lima OH. This location is 1 mile east on Rte. 309, off I-75, Exit 125/126. Free parking, large building, indoor

facilities. No alcoholic beverages allowed on premises. Free camping; electrical hookup $10. Trunk sales, 12-ft and 24-ft areas, $5, plus tickets. Tickets $4 in advance, $5 at the gate. 8-ft. tables, $10 each, includes one free ticket. For table reservations, tickets, SASE to *N.O.A.R.C., P.O. Box 211, Lima OH 45802-0211. Tel. (419) 647-6321, or E-mail [Gas1950@AOL.com]*. Visit the Web site at *[www.Anglefire.com]*.

MASON, MI Lansing Civil Defense Repeater Assn. and Central Michigan ARC will hold the LCERA & CMARC Hamfair and Computer Show at the heated Community Center in the NW corner of the Ingham County Fairgrounds in Mason MI. Take US 127 to the Kipp Rd. exit. Take Kipp Rd. East to the Fairgrounds. Ham gear, electronics, computers. Admission $5 per person. Tables $10. Trunk sales $8. Plenty of parking, handicap parking available. Refreshments, overnight camping available. Vendor setup 6 a.m. Talk-in on 145.390(-600). Contact *Don Tillitson WB8NUS, (517) 321-2004; or Erv Bates W8ERV, (517) 676-2710.* Write to *LCDRA, P.O. Box 80106, Lansing MI 48908*. Send E-mail to *[w8erv @arrl.net]*.

WALLINGFORD, CT The 7th Annual Nutmeg Hamfest & Computer Show, featuring the ARRL Connecticut State Convention, will be held (rain or shine) Oct. 10th, 9 a.m.–3 p.m. at the Mountainside Special Event Facility, High Hill Rd., Wallingford CT. Exit 15 Rte. 91 (North or South), follow signs. General admission $6, children under 12, $3. Inside spaces $25, includes one 10 x 10-ft. booth, one 8-ft. table, one chair, and 2 free passes per vendor. Outside tailgate space, 30 ft. for $15. Vendor setup starts at 6 a.m. Send payment to *Gordon Barker K1BIY, 9 Edge Wood Rd., Portland CT 06480. Tel. (860) 342-3258. E-mail [nutmeghamfest@ qsl.net]*. Visit the Web site at *[www.qsl.net/nutmeghamfest]*. Proceeds from the event will help support public service, scholarship, and civic activities.

OCT 11

BREMERTON, WA The North Kitsap ARC of Silverdale WA will host a hamfest at President's Hall, Kitsap County Fairgrounds, NW corner of Fairgrounds Road at Nels Nelson Rd. Talk-in on 146.62(-) offset PL tone 103.5(-) WWRA rptr., or 146.52 simplex. Admission $5 for 12 and over, under 12 free. New and used equipment. Tables $15 each with 1 free admission until Sep. 30th; $20 each afterwards. Commercial spaces are $30 each. Electrical connection $2 per table. Contact *Marcie Stilwell KC7DAT, P.O. Box 2268, Silverdale WA 98383-2268. Tel. (360) 697-2797; E-mail [nkarc@ yahoo.com]*.

OCT 16

GODFREY, IL The Lewis & Clark Radio Club will hold their Mid-west Amateur Radio & Computer Expo at the Lewis & Clark Community College in Godfrey IL, in the River Bend Arena. Free parking. Indoor flea market, commercial vendors, all handicap accessible. Doors open at 8 a.m. Setup Fri., Oct. 15th after 6 p.m., or Sat., Oct. 16th at 6 a.m. Tables $10 each; call *(618) 254-9465* for reservations. VE exams: Pre-registration is required for "No Code" exams. Walk-ins are okay for all other class exams. For pre-registration or info call *Rich Morgan KF9F, (618) 466-2306.* For info and tickets, write to *Lewis & Clark Radio Club, P.O. Box 553, Godfrey IL 62035; or call (618) 466-1909.* Talk-in on 145.230 and 442.225. E-mail *[N9WHH@ezl. com]*. Visit the Web site at *[http:// WWW.EZL.COM/~LMILLER/ LCRC.HTML]*.

GRAY, TN The 15th Annual Tri-Cities Hamfest will be held by the Kingsport, Bristol, and Johnson City Radio Clubs, on Sat., Oct. 16th, at the Appalachian Fair Grounds, located off I-181 in Gray TN. A large drive-in indoor and outdoor flea market space is available. RV hookups. Admission is $5. Mail inquiries to *P.O. Box 3682 CRS, Johnson City TN 37602.*

OCT 17

KALAMAZOO, MI The 17th Annual Kalamazoo Hamfest will be held at the Kalamazoo County Fairgrounds, starting at 8 a.m. Vendor setup at 6 a.m. Advance tickets $3, $4 at the door. Trunk sales $5. For tickets/tables, send SASE to *Gary Hazelton N8GH, 75075 M-40, Lawton MI 49065.* For contact or info, check the Web site at *[www.qsl.net/ka8blo/ hamfest.html]*; or E-mail *[ka8blo@ net-link.net]*.

SELLERSVILLE, PA The RH Hill ARC Hamfest will be held at the Sellersville Fire House, Rte. 152, 5 miles south of Quakertown and 8 miles north of Montgomeryville PA. Talk-in on 145.31. Admission $5. VE exams 10 a.m.–1 p.m., all classes. Please bring documents. Indoor flea market spaces $12, table included. Outdoor spaces $6, bring tables. For further info, call the Hamfest Hotline: *Linda Erdman (215) 679-5764; 2220 Hill Rd., Perkiomenville PA 18074.* Web site: *[HTTP://WWW.RFHILL. AMPR.ORG]*.

OCT 23

RICKREALL, OR The Mid-Valley ARES, of Salem OR, will present its 5th Annual Swap-Toberfest and Amateur Radio Emergency Services Convention at the Polk County Fairgrounds on Sat., Oct. 23rd. Talk-in on the 146.86(-) rptr. Doors will be open for the convention 9 a.m.–3:30 p.m. Swap table setup will be 6–9 p.m. Fri. night, Oct. 22nd, and on Sat. morning, Oct. 23rd, at 7 a.m. Only 2 pre-registered participants allowed per table during setup; all must register. Self contained RV spaces available, $10 per night. Commercial vendor space $25 (for 2 tables). Mail to *Mid-Valley ARES, P.O. Box 13848, Salem OR 97309.* Pre-registrations post marked by Oct. 8th will receive an extra door prize ticket with each registration. Registrations received Oct. 16th or later will be held for pick-up at the door. Features include meetings and seminars. Additionally, emergency communications vehicles will be on display from Marion and Polk County Emergency Management, Civil Air Patrol, American Red Cross, the Oregon State Police, and others as available. Advance tickets $5, $6 at the door. Age 12 and under free. Non-power swap tables $13 each (do not mix non-power with power). Power swap tables $15 each. For more info contact *Bob Boswell W7LOU, (503) 623-2513; or E-mail to [w7lou@goldcom.com]*. To download a copy of the flyer and pre-registration form, surf the Net for *[http;//www.teleport.com/~n7ifj/ swaptobe.htm]*.

SPECIAL EVENTS, ETC.

SEP 25–26

HAMPTON, VA The VASC Amateur Radio Group, Inc., will operate KE4ZXW Sat., Sep. 25th and Sun., Sep. 26th, 0–2400Z on UO-22 or KO-25; 1500–2200Z at :00 on 7.265; at :15 on 14.265 and at :30 on 28.365. The occasion is to celebrate 4 full years of 9600-baud automatic satellite station operation, and amateur radio exhibit. To apply for an Anniversary QSL, SASE to *Ed Brummer W4RTZ, 108 Oyster Cove Rd., Yorktown VA 23692 USA.*

MIDDLE BASS ISLAND, LAKE ERIE OH The Sandusky Radio Experimental League will operate their station W8LBZ for 24 hours from Middle Bass Island (OH004) in Lake Erie, starting at 16:00 UTC on Sep. 25th and ending at 16:00 UTC on Sep. 26th. Listen for them on 7.230, 14.235, and 28.350. Please QSL with an SASE to *W8LBZ, Sandusky Radio Experimental League, Inc., 2909 W. Perkins, Sandusky OH 44870 USA.* Visit their Web site at [www.qsl.net/w8lbz].

OCT 2–3

CAMBRIDGE, MA The Harvard Wireless Club is celebrating the 90th Anniversary of its founding by Professor George W. Pierce in early 1909. They will be on the air 1200Z–0000Z both days, 24 hours total. Frequencies ± will be: HF SSB—3.890, 7.270, 14.270, 21.370, 28.390. HF CW—35 kHz up from the lower band edges. VHF SSB—50.150, 144.200, 432.150. A special 90th Anniversary QSL will be sent to all those sending QSLs for contacts with the special event station. In addition, each QSL with an SASE enclosed will receive complimentary souvenir QSL cards from past W1AF DXpeditions: US1A, PJ1A, and PJ8H. Mail to *Harvard Wireless Club W1AF, Harvard University, 6 Linden St., Cam- bridge MA 02138, USA.* For fur- ther info, contact club officials at *[w1af@ harvard.edu]*. The club's Web site is at *[http://www.hcs. harvard.edu/ ~w1af/splevent.html]*.

PROPAGATION

Jim Gray W1XU/7
210 E Chateau Circle
Payson AZ 85541
[jimpeg@netzone.com]

September 1999

SUN	MON	TUE	WED	THU	FRI	SAT
			1 F	2 F	3 F-G	4 G
5 G	6 G	7 G	8 G-F	9 F	10 F	11 F-G
12 G	13 G	14 G-F	15 F-G	16 G	17 G	18 G
19 G-F	20 F-P	21 F-P	22 P-F	23 F	24 F-P	25 P
26 P-VP	27 VP	28 VP-P	29 VP-P	30 P		

September

This month is expected to provide some excellent DX opportunities on the HF bands, although Cycle 23 continues its sluggish and slothful ways and the solar flux index remains below 200 at the time of this report (June).

Your *best* days are expected to be 4–7, 12, 13, and 16–18. The *poorest* days are expected to concentrate at the end of the month between the 25th and the 30th, when you can expect a very disturbed magnetic field, poor signals (if any) on DX paths, high RF absorption and strong geophysical upsets on earth, including the possibility of a major hurricane during the last week. (See calendar.) *Semper paratus.*

October

October does not begin well for DX signal propagation on the HF bands. As you can see from the calendar, propagation is expected to be Poor or Very Poor from the 1st through the 9th. A disturbed magnetic field and very upset ionosphere is likely to prevail during that period, and you may expect some other very pronounced geophysical effects on the 7th, 8th, and 9th.

"Conditions" should improve with chances for good DX propagation during the week between the 11th and 18th. However, strong geophysical disturbances will probably return with magnetic field upsets and an active ionosphere for the week between the 20th and 27th. A slight improvement and much better DX propagation is anticipated for the last three days of the month.

Your best opportunities for logging new and possibly rare countries will occur between the 12th and 17th and again on the 30th and 31st. Good luck and patience for the other days.

Band-by-band forecast

10–12 meters

Expect morning F2 path openings to Europe and Africa; on (G) days, midday path openings to South and Central America, and F2 path openings to Japan, Australasia, and the Pacific during the afternoon at your location. DX moves west as the day progresses.

15–17 meters

Expect good DX paths to most areas of the world, with excellent openings from the northern hemisphere to Africa, South America, and the Pacific during hours of daylight and peaking during local afternoon. Good short-skip communication over 1000 miles will occur on (G) days.

20 meters

Very good DX openings to all areas of the world from sunrise through the early darkness hours. The signals will peak an hour or two after sunrise at your location, and again during the afternoon. Short skip beyond about 700 miles will occur during daytime hours.

30–40 meters

Good worldwide DX openings from sunset to sunrise should occur on (G) days. Noise levels (static) will be higher if thunderstorms occur, and can depress audibility. Short skip between 100 and 1000 miles will occur during daylight hours, and at distances beyond 1000 miles at night.

80–160 meters

On 80, DX to the southern hemisphere and to Europe should occur after dark and during sunrise hours—limited, of course, by static noise levels. Daytime short skip to about 350 miles, and beyond 500 miles after dark, will prevail on (G) days. On 160, no daytime propagation will occur due to ionospheric absorption of signals, but after dark, peaking around midnight and again during the predawn hours, you should be able to work many areas of the world. Short skip from 1000–2000 miles or so will prevail during the nighttime hours ...

EASTERN UNITED STATES TO:

GMT	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	15/17	20/30	-	-	-	-	20/30	20/30	-	-	-	15/17
ARGENTINA	20/30	20/30	40	40	-	-	-	-	-	10/12	10/12	15/17
AUSTRALIA	15/17	-	20/30	-	-	40	20/30	20/30	-	-	-	15/17
CANAL ZONE	15/17	20/30	40*	40*	40	-	20/30	20/30	20/30	10/12	10/12	15/17
ENGLAND	40	40	40*	40	-	-	20/30	15/17	10/12	10/12	20/30	20/30
HAWAII	15/17	20/30	20/30	40	40	40	20/30	20/30	-	-	10/12	10/12
INDIA	-	-	-	-	-	-	20/30	20/30	-	-	-	-
JAPAN	15/17	20/30	-	-	-	-	20/30	20/30	-	-	-	15/17
MEXICO	15/17	20/30	40*	40*	40	-	20/30	20/30	20/30	10/12	10/12	15/17
PHILIPPINES	-	-	-	-	-	-	20/30	20/30	-	-	-	-
PUERTO RICO	15/17	20/30	40*	40*	40	-	20/30	20/30	20/30	10/12	10/12	15/17
RUSSIA (C.I.S.)	40	40	-	-	-	-	-	15/17	15/17	20/30	-	-
SOUTH AFRICA	20/30	-	-	-	-	-	-	-	15/17	15/17	10/12	20/30
WEST COAST	40	80	-	-	-	-	-	20/30	20/30	20/30	15/17	40

CENTRAL UNITED STATES TO:

GMT	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	15/17	-	-	-	-	-	-	-	-	-	-	15/17
ARGENTINA	15/17	20/30	20/30	40	40	-	-	-	-	-	10/12	15/17
AUSTRALIA	15/17	20/30	20/30	20/30	-	40	80	-	-	-	-	15/17
CANAL ZONE	15/17	20/30	20/30	40*	40*	-	-	15/17	15/17	10/12	10/12	15/17
ENGLAND	-	40/80	40/80	-	-	15/20	15/17	15/17	20/30	20/30	20/30	-
HAWAII	15/17	20/30	20/30	40	40	40*	80	20/30	-	-	10/12	15/17
INDIA	-	-	-	-	-	-	-	20/30	-	-	-	-
JAPAN	15/17	-	-	-	-	-	-	-	-	-	-	15/17
MEXICO	15/17	20/30	20/30	40*	40*	-	-	15/17	15/17	10/12	10/12	15/17
PHILIPPINES	16/17	20/30	-	-	-	-	-	20/30	-	-	-	-
PUERTO RICO	15/17	20/30	20/30	40*	40*	-	-	15/17	15/17	10/12	10/12	15/17
RUSSIA (C.I.S.)	-	-	-	-	-	-	-	20/30	15/17	20/30	-	-
SOUTH AFRICA	20/30	-	-	-	-	-	-	-	-	15/17	15/17	20/30

WESTERN UNITED STATES TO:

GMT	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	10/15	15/17	15/17	20/30	20/30	20/30	40	40	-	-	-	15/17
ARGENTINA	10/15	20/30	20/30	40-	-	-	-	-	-	-	15/17	10/15
AUSTRALIA	10/12	15/17	15/17	20/30	20/30	40-	40	40-	20/30	20/30	15/20	15/17
CANAL ZONE	20/30	20/30	40/20	40/20	40	-	-	20/30	15/17	15/17	10/12	10/12
ENGLAND	-	-	-	-	-	-	-	-	-	15/20	15/20	-
HAWAII	10/12	15/17	20/15	40	40*	40*	40	40	-	20/30	20/30	20/30
INDIA	15/20	15/20	-	-	-	-	-	-	20-	-	-	-
JAPAN	10/15	15/17	15/17	20/30	20/30	20/30	40-	40-	-	-	-	15/17
MEXICO	20/30	20/30	40/20	40/20	40	-	-	20/30	15/17	15/17	10/12	10/12
PHILIPPINES	15/20	15/20	-	20/30	-	40-	40-	-	20/30	20/30	-	15/17
PUERTO RICO	20/30	20/30	40/20	40/20	40	-	-	20/30	15/17	15/17	10/12	10/12
RUSSIA (C.I.S.)	-	-	-	-	-	-	-	-	20/30	-	-	-
SOUTH AFRICA	20/30	20/30	-	-	-	-	-	-	-	15/17	15/17	20/15
EAST COAST	40	80	-	-	-	-	-	20/30	20/30	20/30	15/17	40

October 1999						
SUN	MON	TUE	WED	THU	FRI	SAT
					1 VP-P	2 P
3 P-F	4 F-P	5 P	6 P	7 P-VP	8 VP	9 VP-P
10 P-F	11 F-G	12 G	13 G	14 G	15 G	16 G
17 G	18 G-F	19 F-P	20 P-VP	21 VP	22 VP-P	23 P
24 P-VP	25 VP	26 VP-P	27 P	28 P-F	29 F-G	30 G
31 G						

but, as always, it will be limited by high static levels from thunderstorm activity.

Don't forget to work the *darkness path* (±30 minutes around local sunset).

Check the bands above and below the suggested ones for possible DX surprises. It's often a good idea to park your receiver on a seemingly unused frequency and just wait. A DX station is very likely to pop up before any one else hears him, and you can snag a good catch.

Please note that the Band-Time-Country chart is the same for both September and October; (*) indicates a possible 80 meter opening; and (-) indicates a difficult path. Good hunting! W1XU/7.

NEVER SAY DIE

continued from page 42

tasting fruit and vegetables, that spreading about one pound of Azomite per ten square feet of garden will get plants to grow about three times faster. Even trees!

Azomite is some stuff they dig up out in Utah from what used to be an ancient seafloor bed. More and more nursery suppliers are stocking it.

Now, I wonder what would happen if someone were to use all 13 of the plant growth enhancers I've written about so far, all at once?

By the way, there's a new printing of the soil book, which has been difficult to find. Call ASD at 800-243-1438 and tell 'em Wayne sent you.

Collapse

Even listening to Gary North being interviewed by Art Bell about the ramifications of Y2K tends to almost get me thinking.

So what would happen if millions of people got worried enough about the potential problems the Y2K bug might generate to put aside some cash? You know, just in case?

There's enough cash in circulation to take care of little more than a small extra demand, and yes, I know about the S50 billion the treasury is printing to try to meet the problem. Our whole money system is a house of cards. We get paid, we put our money into a bank and then draw checks on it. The bank's business is lending out our money and getting paid interest on the loans, so they lend out 97% of the money deposited. Everything works just fine until several depositors simultaneously withdraw their money. It doesn't take much of this before the well runs dry. Three percent.

So what will happen if there is even a slight panic and depositors start either drawing out some cash (just in case) or not making any more deposits, but continue to pay their bills with checks? The banks will quickly run out of money and not be able to honor the checks. What will happen if people stop depositing their paychecks, but ask for cash instead? There will be no cash. What if cash-heavy businesses such as fast food restaurants start holding back some cash every day, you know, just in case. The whole banking system would collapse.

The interesting aspect of all this is that there is nothing the banks can do to avoid the coming problem!

I'm reminded of what happened in California right after a recent earthquake. Within a couple hours, every shelf in the local food stores had been picked clean.

Panic Attack

The media are finally beginning to wake up to the potential ramifications of the Y2K problem. Maybe you read the recent *BusinessWeek* article, *Y2K Is Worse Than Anyone Thought*. Probably not. Why do I have to do your homework for you? Anyway, the gist of the article was that our major corporations are finally beginning to understand how serious the little computer bug can be for them and they're substantially upping their remediation budgets. The total Y2K cost now has gone over $1 trillion! Company executives are beginning to panic as they realize that they've sent some boys to do a man's job. And one thing they can't stop is the ticking of the clock. Not even The Zipper can do that.

Economists are predicting a major stock market recession. So what will happen if enough people believe this and want to "get out of the market before the crash," looking to keep from losing their investments, and also to be in a position to buy back in when stocks are low? The market only goes up when there are more buyers than sellers. A panic could result in millions of sellers and no buyers. Crash!

Having been around in 1929 and the depression years of the '30s, I remember that it took World War II to pull us out of the mess Congress got us into.

Hey, maybe if we ignore it, Y2K will go away. But, just in case, have you got an emergency rig handy?

Hamburgers

Hamburgers have elbowed hot dogs and apple pie from the head of the American food chain. Well, it's no wonder almost everyone loves hamburgers. They're juicy and delicious. They also are a deadly concoction as far as your body is concerned.

How so? Well the beef is made from cows who have been fed growth hormones to speed their growth. They're fed the most fattening diet known to farmers because fat tastes good. It helps make the hamburgers juicy. But you also get a good slug of those hormones with your meat patty. You also get the adrenaline the cow generates when it is scared out of its wits as it is being killed. The hamburger roll is made of white flour, which has had every bit of nutrition removed. It has zero food value. That tiny shred of lettuce has almost no nutritive value either. The slice of pickle is from a dead cucumber soaked in brine. It also provides zero nutrition.

The meat is thoroughly cooked so all the germs it has gathered (e.g., salmonella) along the way will get killed. McDonald's doesn't want the bad publicity killing its customers quickly would generate. The human digestive system is not well equipped to digest cooked meat, so it tends to pass through the system, leaving its toxins and contributing most of the bad smells that we have to use Airwick to kill in the bathroom. The worse the smell, by the way, the more toxic the stuff you've been eating.

Say, have you read Robin Cook's *Toxin?* It has to do with a young girl dying a horrible death from E. coli after eating a hamburger, and the efforts of the restaurant chain and the meat industry to

cover up the situation. The book might even discourage you from eating so many Whoppers.

Advice for Septuagenarians

With such a high percentage of the response to my last guest shot on the Art Bell show being from people in their 70s, I got to thinking about the special problem seniors have. Many are living on Social Insecurity, plus small pensions, unless they were downsized before their pensions could kick in. But no matter the circumstances, most seniors are interested in how they can make some extra money.

Beyond the age of 50, it is very difficult to ever get employment again. You're too old. So even people in their 50s are looking for money-making ideas. Indeed, there are thousands of scam artists out there trailing bait, looking to take advantage of this mushrooming group.

Yes, of course I have some advice for you, if you're a senior, or for you to pass along, if you know any seniors who need extra money.

Well, firstly, unless you've led a truly wasted life, you should, by now, be an expert in *something*. Thus you have the potential to either teach or advise others (a.k.a. consulting). One of the best ways to teach is to write a book. Then comes the question of how to promote and sell the book. My preference is by mail order. You can get the word out via a Web page on the Internet, through new product releases to appropriate magazines, and through book reviews in the magazines. I have a video which explains how to do things like that.

Articles published in magazines will also establish you as an expert. That'll help sell your book and also help get you consulting work.

If you've managed to work for 30 to 40 years without learning anything, maybe it's time to break the ice and start learning something. I've found that a year or two of serious reading and asking questions can make a person an expert in almost any field that interests them. Even nuclear physics.

When I got interested in horseback riding, I took lessons and then more lessons. I read everything I could find. I got good enough to show horses, teach instructors, and was even asked to ride Ringling Brother's star performer, Starlit Night. I've a Professor of Horsemanship certificate. Bragging? Of course, but I wanted to prove a point.

When I got interested in skiing, I took lessons until I was able to handle even the most difficult of trails.

When it comes to learning, persistence counts far more than brains. Please, if you can, show me one member of Mensa who is successful in business.

Of course, if you abuse your body with poisons, poor nutrition, and dehydration, you're going to be hobbling around in a rest home in your 70s, not skiing Aspen with me. And you're going to have a lot more trouble selling your lifetime of expertise to people. You start out with pretty much the same model body as everyone else, so it's what you do in the way of maintenance that's going to count later on — just as it does with your car.

Reviewers Needed

Between the tons (well, bushels) of mail resulting from my talk radio interviews and my procrastination on taking a super speed reading course, I'm pitifully backed up on reading "books you really should read" so I can review them for you.

And that put me in mind of the system I used when I was publishing *CD Review* magazine. There I asked the readers to review any new CDs they'd bought and rate them. The result was millions of ratings, which I dutifully reported in the magazine, and then compiled later for a catalog of all issued CDs, so in addition to the normal CD information, I also had the reader ratings listed. One result of all this work was that my readers were spending an average of $30 million a month buying the CDs I was recommending. The other result was that the six major labels (five foreign-owned) hated my magazine because we couldn't be bought or coerced. But they still had to advertise, even though we gave many of their CDs lousy ratings. Well, I've always been that way. When I published *80-Micro*, about the Radio Shack TRS-80, once they tried to influence what I was publishing, I refused to let them advertise any more. They sent an executive team to visit me, promising to behave, so I let them advertise again. Then, a couple months later, more pressure, so I told them that was that. No more advertising. Well, it was only four to six pages a month at about $3,000 or so a page.

Oh, darn, there I go off on a tangent again.

Anyway, what I had in mind was that if you run across a book that you feel the readers (and I) are crazy if we don't read, please don't put the monkey on my back to read it and write a review. Write a review and send it to me. If you convince me, I'll publish it in *73*. If you *really* convince me, I'll get a copy, read it, and add a review to my *Secret Guide to Wisdom*. What's in it for you, other than knowing that you've helped a lot of people? Well, how about a minuscule bribe of a $10 credit toward buying my books.

There are a zillion books out there, but a painfully small number of them are really worth reading. I'm looking for books that will help me and my readers understand themselves, the world, and what we can do to improve it, and to improve their lives. Let's keep this to truly exciting books, okay? Surprise me.

Politics

The presidential hopefuls have been flocking to New Hampshire, as they do every four years. Steve Forbes was up here with his socks off, testing the icy February waters. So I had dinner with him. Well, to be honest about it, so did a couple hundred others, when Steve gave a talk to the Hudson Chamber of Commerce. But it gave me an opportunity to say hello, remind him of the compact disc I made for *Forbes* a few years ago, and the dinner we had together on his yacht. He said he remembered, but I suspect he was just being agreeable. I took the opportunity to slip him a summary of a new approach to campaigning which I think could keep him on the front pages for the next year. I was not surprised when nothing came of it. Loser.

Anyway, I got to talking with the chap sitting next to me and, you're going to find this hard to believe, but the subject of Y2K came up. He said that he thought it wasn't anything to worry about. Programmers will be able to fix the date problem in time. Music to my ears. Love it.

I reminded him of the time a couple years ago when a branch fell across a power line in a remote area and it collapsed the entire western power grid for hours. And the time the East Coast went black when a small power station in Ontario had a problem. I asked him what he thought might happen if the national grid failed. This would stop almost everything. No trains, no planes, no gas pumps working, no telephone, no cash registers in food stores, and so on. Without trains there would be no coal for generating power, and 75% of our power is made from coal. No businesses could operate, no banks, and so on. How could the government, without communications, get the power turned back on? It's a house of cards.

So what happens to the 7 million people in New York and all the other cities with no power, no food, no water, and no police? Maybe for weeks.

I think I worried him.

Minimum Wages

With our labor union lobby-

Continued on page 64

Wise Up!

Here are some of my books which can change your life (if you'll let 'em). If the idea of being healthy, wealthy and wise interests you, start reading. Yes, you can be all that, but only when you know the secrets which I've spent a lifetime uncovering.

......Wayne

The Bioelectrifier Handbook: This explains how to build or buy ($155) a little electrical gadget that can help clean the blood of any virus, microbe, parasite, fungus or yeast. The process was discovered by scientists at the Albert Einstein College of Medicine, quickly patented, and hushed up. It's curing AIDS, hepatitis C, and a bunch of other serious illnesses. The circuit can be built for under $20 from the instructions in the book. $10 (01)

The Secret Guide to Wisdom: This is a review of around a hundred books that will help you change your life. No, I don't sell these books. They're on a wide range of subjects and will help to make you a very interesting person. Wait'll you see some of the gems you've missed reading. $5 (02)

The Secret Guide to Wealth: Just as with health, you'll find that you have been brainwashed by "the system" into a pattern of life that will keep you from ever making much money and having the freedom to travel and do what you want. I explain how anyone can get a dream job with no college, no résumé, and even without any experience. I explain how you can get someone to happily pay you to learn what you need to know to start your own business. $5 (03)

The Secret Guide to Health: Yes, there really is a secret to regaining your health and adding 30 to 60 years of healthy living to your life. The answer is simple, but it means making some difficult lifestyle changes. Will you be skiing the slopes of Aspen with me when you're 90 or doddering around a nursing home? Or pushing up daisies? No, I'm not selling any health products. $5 (04)

My WWII Submarine Adventures: Yes, I spent from 1943-1945 on a submarine, right in the middle of the war with Japan. We almost got sunk several times, and twice I was in the right place at the right time to save the boat. What's it really like to be depth charged? And what's the daily life aboard a submarine like? How about the Amelia Earhart inside story? If you're near Mobile, please visit the Drum. $5 (10)

Travel Diaries: You can travel amazingly inexpensively – once you know the ropes. Enjoy Sherry and my budget visits to Europe, Russia, and a bunch of other interesting places. How about a first class flight to Munich, a rented Audi, driving to visit Vienna, Krakow in Poland (and the famous salt mines), Prague, back to Munich, and the first class flight home for two, all for under $1,000. Yes, when you know how you can travel inexpensively, and still stay in first class hotels. $5 (11)

Wayne's Caribbean Adventures: More budget travel stories – where I visit the hams and scuba dive most of the islands of the Caribbean. Like the special Liat fare which allowed us to visit 11 countries in 21 days, with me diving all but one of the islands. Guadeloupe, where the hams kept me too busy with parties. $5 (12)

Cold Fusion Overview: This is both a brief history of cold fusion, which I predict will be one of the largest industries in the world in the 21st century, plus a simple explanation of how and why it works. This new field is going to generate a whole new bunch of billionaires, just as the personal computer industry did. $5 (20)

Cold Fusion Journal: They laughed when I predicted the PC industry growth in 1975. PCs are now the third largest industry in the world. The cold fusion ground floor is still wide open, but then that might mean giving up watching ball games. Sample: $10 (22).

Julian Schwinger: A Nobel lauriate's talk about cold fusion—confirming its validity. $2 (24)

Improving State Government: Here are 24 ways that state governments can cut expenses enormously, while providing far better service. I explain how any government bureau or department can be gotten to cut it's expenses by at least 50% in three years and do it cooperatively and enthusiastically. I explain how, by applying a new technology, the state can make it possible to provide all needed services without having to levy *any* taxes at all! Read the book, run for your legislature, and let's get busy making this country work like its founders wanted it to. Don't leave this for "someone else" to do. $5 (30)

Mankind's Extinction Predictions: If any one of the experts who have written books predicting a soon-to-come catastrophe which will virtually wipe us all out are right, we're in trouble. In this book I explain about the various disaster scenarios, from Nostradamus, who says the poles will soon shift, wiping out 97% of mankind, to Sai Baba, who has recently warned his followers to get out of Japan and Australia before December 6th this year. The worst part of these predictions is the accuracy record of some of the experts. Will it be a pole shift, a new ice age, a massive solar flare, a comet or asteroid, a bioterrorist attack, or even Y2K? I'm getting ready, how about you? $5 (31)

Moondoggle: After reading René's book, *NASA Mooned America*, I read everything I could find on our Moon landings. I watched the videos, looked carefully at the photos, read the astronaut's biographies, and talked with some of my readers who worked for NASA. This book cites 25 good reasons I believe the whole Apollo program had to have been faked. $5 (30)

Classical Music Guide: A list of 100 CDs which will provide you with an outstanding collection of the finest classical music ever written. This is what you need to help you reduce stress. Classical music also raises youngster's IQs, helps plants grow faster, and will make you healthier. Just wait'll you hear some of Gotschalk's fabulous music! $5 (33)

The Radar Coverup: Is police radar dangerous? Ross Adey K6UI, a world authority, confirms the dangers of radio and magnetic fields. $3 (34)

Three Gatto Talks: A prize-winning teacher explains what's wrong with American schools and why our kids are not being educated. Why are Swedish youngsters, who start school at 7 years of age, leaving our kids in the dust? Our kids are intentionally being dumbed down by our school system — the least effective and most expensive in the world. $5 (35)

Aspartame: a.k.a. NutraSweet, the stuff in diet drinks, etc., can cause all kinds of serious health problems. Multiple sclerosis, for one. Read all about it, three pamphlets for a buck. (38)

One Hour CW: Using this sneaky method even *you* can learn the Morse Code in one hour and pass that dumb 5wpm Tech-Plus ham test. $5 (40)

Code Tape (T5): This tape will teach you the letters, numbers and punctuation you need to know if you are going on to learn the code at 13 or 20 wpm. $5 (41)

Code Tape (T13): Once you know the code for the letters (41) you can go immediately to copying 13 wpm code (using my system). This should only take two or three days. $5 (42)

Code Tape (T20): Start right out at 20 wpm and master it in a weekend for your Extra Class license. $5 (43)

Wayne Talks Not at Dayton: This is a 90-minute tape of the talk I'd have given at the Dayton, if invited. $5 (50)

Wayne Talks at Tampa: This is the talk I gave at the Tampa Global Sciences conference. I cover cold fusion, amateur radio, health, books you should read, and so on. $5 (51)

$1 Million Sales Video: How to generate extra million in sales using PR. This will be one of the best investments your business ever made. $43 (52)

Reprints of My Editorials from *73*.

Grist I: 50 of my best non-ham oriented editorials from before 1997. $5 (71)

Grist II: 50 more choice non-ham editorials from before 1997. $5 (72)

1997 Editorials: 148 pages. 216 editorials discussing health, ideas for new businesses, exciting new books I've discovered, ways to cure our country's more serious problems, flight 800, the Oklahoma City bombing, more Moon madness, and so on. $10 (74)

1998 Editorials: 168 pages that'll give you lots of controversial things to talk about on the air. $10 (75)

Silver Wire: With two 3" pieces of heavy pure silver wire + three 9V batteries you can make a thousand dollars worth of silver colloid. What do you do with it? It does what the antibiotics do, but germs can't adapt to it. Use it to get rid of germs on food, for skin fungus, warts, and even to drink. Read some books on the uses of silver colloid, it's like magic. $15 (80)

Wayne's Bell Saver Kit. The cable and instructions enabling you to inexpensively tape Art Bell W6OBB's nightly 5-hr radio talk show. $5 (83)

Stuff I didn't write, but you need:

NASA Mooned America: René makes an air-tight case that NASA faked the Moon landings. This book will convince even you. $25 (90)

Last Skeptic of Science: This is René's book where he debunks a bunch of accepted scientific beliefs – such as the ice ages, the Earth being a magnet, the Moon causing the tides, and etc. $25 (91)

Dark Moon: 568 pages of carefully researched proof that the Apollo Moon landings were a hoax. $35 (92)

Wayne Green

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Barter 'n' Buy

Turn your old ham and computer gear into cash now. Sure, you can wait for a hamfest to try and dump it, but you know you'll get a far more realistic price if you have it out where 100,000 active ham potential buyers can see it, rather than the few hundred local hams who come by a flea market table. Check your attic, garage, cellar and closet shelves and get cash for your ham and computer gear before it's too old to sell. You know you're not going to use it again, so why leave it for your widow to throw out? That stuff isn't getting any younger!
The *73* Flea Market, Barter 'n' Buy, costs you peanuts (almost)—comes to 35 cents a word for individual (noncommercial!) ads and $1.00 a word for commercial ads. Don't plan on telling a long story. Use abbreviations, cram it in. But be honest. There are plenty of hams who love to fix things, so if it doesn't work, say so.
Make your list, count the words, including your call, address and phone number. Include a check or your credit card number and expiration. If you're placing a commercial ad, include an additional phone number, separate from your ad.
This is a monthly magazine, not a daily newspaper, so figure a couple months before the action starts; then be prepared. If you get too many calls, you priced it low. If you don't get many calls, too high.
So get busy. Blow the dust off, check everything out, make sure it still works right and maybe you can help make a ham newcomer or retired old timer happy with that rig you're not using now. Or you might get busy on your computer and put together a list of small gear/parts to send to those interested?

Send your ads and payment to: *73 Magazine*, Barter 'n' Buy, 70 Hancock Rd., Peterborough NH 03458 and get set for the phone calls. The deadline for the December 1999 classified ad section is October 10, 1999.

NEVER SAY DIE

continued from page 62

ists spending what it takes to convince Congress to increase the minimum wage, the welfare of the public is, as usual, being lost in the process. Reliable studies have shown that when the minimum wage is raised, it destroys jobs for unskilled workers — who are mainly teenagers and young adults. It also increases the number of families below the poverty line. The net effect of increasing the minimum wage is to increase poverty rather than decrease it.

The last time the minimum wage was increased, 380,000 young workers lost their jobs, and that was almost 10% of the workers affected by the legislated wage increase. Thanks, Congress. And thank you, voters, for ignoring what your supposed representatives are doing with your money.

Have I got my facts straight? Check *Fortune*, October 12, 1998, page 66.

Shots

I see that Bill Gates, who is suffering from the mountains of bad publicity the Microsoft anti-monopoly trial and his testimony have caused, has his PR team working overtime to repair the damage. First it was a golf club commercial on TV. I somehow doubt that Bill needed the money, so there must have been some other reason for that. Then there was his appearance on the Rosie O'Donnell Show. And now he's giving $100 million to help vaccinate people in developing countries. And that, in general, means Africa.

Getting through the insulating layers protecting Bill from the rest of the world isn't easy, but I wish someone could clue him in about the reality of inoculations. There are several well-researched books on the subject, and they all say the same thing — inoculations are a scam — a $40 billion scam. Worse, there's strong evidence that AIDS was spread in Africa when millions were given TB vaccinations. Well, read Dr. William Douglass' book on the subject. And, as far as vaccinations being of value, please at least read the book by Dr. Walene James, *Immunization — The Reality Behind the Myth.* Yes, I've reviewed it in a past editorial and it's in my *Secret Guide to Wisdom* (page 5).

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FQY — page 18

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OCTOBER 1999
ISSUE #468

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TABLE OF CONTENTS

FEATURES

DEPARTMENTS

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On the cover: The Fractal Quad Yagi gets reexamined beginning on page 18. We are always looking for interesting articles and cover photos — with or without each other. Your name could be in this space *next* month, and our check could be on its way to *you!* You couldn't use a little extra cash?

Feedback: Any circuit works better with feedback, so please take the time to report on how much you like, hate, or don't care one way or the other about the articles and columns in this issue. G = great!, O = okay, and U = ugh. The G's and O's will be continued. Enough U's and it's Silent Keysville. Hey, this is *your* communications medium, so don't just sit there scratching your...er...head. FYI: Feedback "number" is usually the page number on which the article or column starts.

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NEVER SAY DIE

Wayne Green W2NSD/1
w2nsd@aol.com

Writing for *73*

If you've built something you think other hams might find fun to build, for heaven's sake write and tell us about it. If you've done something unusual in hamming, share it with us. If you've bought a new piece of equipment and want to tell others how much fun you're having with it, get busy with your word processor. Hey, we're all looking to our hobby to be fun and exciting, so share the fun you've had.

When I got involved with RTTY 50 years ago, I had so much fun it should have been illegal. I couldn't help but want to share the fun with as many others as I could, so I started a RTTY newsletter. Pretty soon I had a little 2,000-paid-circulation magazine. And that led to a RTTY column in *CQ*. Then, when I got the editor a better job, I found myself in ham heaven as the editor of the magazine. Wow! And when they owed me so much money they had to fire me, I started *73*. But all that happened because I wanted to share the fun I was having.

Even if you don't want to end up as the editor or publisher of a ham rag, you can help other hams to have more fun by writing about the things you've found exciting.

Which is why I'm trying to get repeaters to provide crossband contacts to the HF DX bands. Which is why I'm urging our experimenters to get busy with compression codes to narrow down voice bandwidths, and maybe even make more than slow scan video possible on the DX bands. And to improve packet throughput. Do it, then write about it.

One more benefit, in addition to the awe and adulation you'll get as a published author, plus some cash from the magazine, is that if you are a sucker enough to be working for others, if you change jobs you'll find that every article you've had published will add about a thousand dollars per year to your new salary.

It's easy to write for *73*. Drop me a note and I'll send you a little booklet with the details. And, now, in these days of digital photography, it's getting easier and easier to submit photos. Even by E-mail.

You can submit articles to *73* by E-mail at [design73@aol.com]. If you have any questions, you can get in touch with me at [w2nsd@aol.com].

Now get busy!

Dayton 1999

Attendees reported that the number of exhibitors was down. The flea market was down. Attendance was way down. The benefit was that it was a lot easier to get around or to get food (none of which was any good for your body). The down side was that there was less to see and less to buy. Many of the exhibitors who did come were crying the blues. And the percentage of computer-oriented exhibitors was up.

I looked over their list of speakers to see what I'd miss if I didn't go this year, thereby saving me almost a week of my time. I found a couple of speakers who looked interesting. Oh, well, that meant more time to get around to the exhibits. But couldn't the organizers have lined up at least one star attraction?

Only the HamVention Committee knows what the actual paid attendance was, and I doubt they'll share this information. The guesstimates I've heard put the attendance at around 15,000 — about half what it was a few years ago.

And that makes sense since the number of new HF hams has dried up, and there isn't a lot of attraction for our nocoders at an ARRL-dominated convention. The sad truth is that almost nothing has changed in the HamVention formula in the last 40 years, while technology has been going through the roof. Dayton, a monument to amateur radio's past.

I attended my first HamVention in 1955. The only difference was that it was then small enough to be held in the Dayton Biltmore Hotel. I attended my first hamfest in 1938 in New York City and, other than the computer exhibitors, I would be hard put to cite any significant changes in the hamfest format back sixty years ago from Dayton today. The big news then was the new Hallicrafters Skyrider Diversity, a receiver technology that never caught on.

How Bad Is It?

Are the predictions of doom for amateur radio just more of the usual Chicken Little hype? Or is there a fire causing all that smoke? I took a quick look at the FCC licensing figures for April 1999, with a comparison of the figures for 1998 and 1997. The number of new Techs has dropped 45% in the last two years. And ditto the number of Techs upgrading to General.

How far is the ARRL going to let this go before they start trying to promote the hobby?

I got a call from a radio station the other day, asking if I'd be interested in running a program about amateur radio. I said I'd give it a try. Then they admitted that they'd called the ARRL first and were told that the program wasn't important enough for the ARRL to be bothered.

Hell, if the League officials and the members don't care whether amateur radio continues or not, why should I go out of my way to do something about it?

Smallpox

This news flash isn't from an E-mail or conspiracy newsletter, it's right out of the July 12th *The New Yorker*! It's a long and interesting article about the world eradication of the smallpox virus — the deadliest virus in history. It's killed more people than any other disease. It's killed over 300 million people just in the 20th century! And that was during a time when large parts of the world population had smallpox vaccinations. Now those have all worn off, leaving the world extremely vulnerable.

Twenty years ago the World Health Organization declared smallpox eradicated from humans. However, it's explosively contagious, traveling by air when an infected person talks. Anyone within ten feet is vulnerable. If you inhale one single particle you'll come down with the disease. You'll feel normal for about ten days, then you suddenly get sick. Very sick. The red spots turn to blisters, which grow and burst, causing incredible pain … and death.

The WHO had ten million doses of the vaccine stored in Geneva until they had all but a half million doses destroyed ten years ago. And that's okay since the only remaining samples of the virus were stored

Continued on page 26

QRX . . .

Number 6 on your Feedback card

Sayonara

One of the world's best-known DXers is no longer a licensed radio amateur. This, with the announcement that Yasuo Miyazawa JH1AJT, has surrendered his amateur radio station license to Japanese telecommunications authorities in the wake of accusations that another ham sat in for Miyazawa's upgrade examination.

Going by the nickname of Zorro, JH1AJT was one of the rising stars in the DX world until last June. That's when the *Daily DX* newsletter carried an article from a Japanese-language newspaper saying that Miyazawa and another Japanese amateur had been arrested after allegedly obtaining an operator license using false identification.

According to the *Daily DX* story, in October 1955, Hirohiko Daikoku JG3QCW allegedly took Japan's Second Class amateur license test for Miyazawa. At the time, Miyazawa was a Fourth Class ticketholder. That's the equivalent of our No-Code Tech.

The circumstances surrounding the investigation that lead to Miyazawa's arrest have never been revealed. It is known that in addition to his own JH1AJT ticket, Miyazawa has also turned in the callsign 7J1YAJ, for which he was a trustee.

Over the years, Miyazawa has operated from many sought-after DX spots throughout Asia, Africa, and the Pacific. He had been scheduled to receive the DXer of the Year Award at the New Orleans International DX Convention on August 28th. By mutual consent that award was not given this year.

Thanks to David Black KB4KCH, reporting for Newsline. *Bill Pasternak WA6ITF, editor.*

Only in America ...

Only in America ... can a pizza get to your house faster than an ambulance.

Only in America ... are there handicap parking places in front of a skating rink.

Only in America ... do people order double cheeseburgers, a large fries, and a Diet Coke.

Only in America ... do banks leave both doors open and then chain the pens to the counters.

Only in America ... do we leave cars worth thousands of dollars in the driveway and leave useless things and junk in boxes in the garage.

Only in America ... do we use answering machines to screen calls and then have call waiting so we won't miss a call from someone we didn't want to talk to in the first place.

Only in America ... do we buy hot dogs in packages of 10 and buns in packages of eight.

Only in America ... do we use the word "politics" to describe the process so well: "poli" in Latin meaning "many" and "tic" meaning "blood-sucking creatures."

Thanks to the Internet's "Joke A Day," as reprinted in the November 1998 ARNS Bulletin.

Top 10 New Codes and Procedural Symbols for CW Operating

10. Sent: 4vv44

Meaning: Rig works fine, but I don't know how to send code.

9. Sent: CAA

Meaning: I want to call CQ, but I don't know how to send code.

8. Sent: QRL ... CQ

Meaning: I can send OK, but I don't know procedure.

7. Sent: H99 or HNN

Meaning: Your report is great, but I don't know how to send code.

6. Sent: CQ ... KN

Meaning: I can send OK, but I don't know procedure.

5. Sent: SRI QRM ES QRN ES QSB

Meaning: I can send OK, but I can't copy code.

4. Sent: R R R ...

Meaning: Copied just fine, but I haven't thought up something to say yet.

3. Sent: BT... BT... BT

Meaning: Trying to think of something else to say.

2. Sent: NAME IS 606

Meaning: My name is Bob and I can't send code.

And the Number 1 New Code or Procedural Symbol for CW Operating:

1. Sent: CQ NV

Meaning: I'm in the contest, but I can't send code.

Thanks to Low Down, *official journal of the Colorado QRP Club [cqc@aol.com].*

The World's Greatest Computer

Imagine a computer the size of a grapefruit, packed with 10 billion transistors and 10 trillion wires. Imagine, too, that this computer grows to full size all by itself, from a set of plans far too small for the eye to see. And imagine that it spends its long lifetime, commonly 70 years or more, running its own support machinery; that it keeps itself at a comfortable working temperature and supplied with energy and raw materials; and that it learns from its mistakes. Add to this the ability to add up grocery bills, prepare tax returns, write poetry, enjoy music, dream of dragons, and fall in love. What you have imagined, of course, is your own brain.

Thanks to the September 1998 issue of The Electron, *the newsletter of the Sterling-Rock Falls ARS, Lunda Bramm KB9CZD, editor.*

More Laws

• O'Reilly's Law of the Kitchen: Cleanliness is next to impossible.

• Lieberman's Law: Everybody lies, but it doesn't matter since nobody listens.

• Gold's Law: If the shoe fits, it's ugly.

• Conway's Law: In any organization, there will always be one person who knows what is going on. This person should be fired.

• Finster's Law: A closed mouth gathers no feet.

• Lynch's Law: When the going gets tough, everyone leaves.

• Muir's Law: When we try to separate anything out by itself, we find it hitched to everything else in the universe.

• Glyme's Formula for Success: The secret of success is sincerity. Once you can take that, you've got it made.

• Mason's First Law of Synergism: The one day you'd sell your birthright for something, birthrights are a glut.

• Hanlon's Razor: Never attribute to malice that which is adequately explained by stupidity.

• Handy Guide to Modem Science: If it's green or wriggles, it's biology. If it stinks, it's chemistry. If it doesn't work, it's physics.

• Green's Law of Debate: Anything is possible if you don't know what you're talking about.

• Stewart's Law of Retroaction: It is easier to get forgiveness than permission.

• First Rule of History: History doesn't repeat itself, historians merely repeat each other.

• Oliver's Law of Location: No matter where you go, there you are.

• Harrison's Postulate: For every action, there is an equal and opposite criticism.

This appeared in the August 1998 issue of Watts News, *the monthly newsletter of the Olympia (WA) ARS, George Lanning KB6LE, editor. It was reprinted in the November 1998 ARNS* Bulletin. *By the way, to these we add Burnett's Decree of Destination Delay: The more in advance you know about something, the later to it you will be.*

Windows 2000 Error Messages

The following are new Windows messages that are reportedly included in Windows 2000:

1. Enter any 11-digit prime number to continue.
2. Press any key to continue or any other key to quit.
3. Press any key except ... no, No, NO, NOT THAT ONE!
4. Bad command or file name! Go stand in the corner.

5. This will end your Windows session. Do you want to play another game?

6. Error saving file! Format drive now? (Y/Y)

7. This is a message from God Gates: "Rebooting the world. Please log off."

8. To "shut down" your system, type "WIN."

9. BREAKFAST.SYS halted ... Cereal port not responding.

10. COFFEE.SYS missing ... Insert cup in cup holder and press any key.

11. File not found. Should I fake it? (Y/N)

12. Runtime Error 6D at 417A:32CF: Incompetent User.

13. Error reading FAT record: Try the SKINNY one? (Y/N)

14 WinErr 16547: LPT1 not found. Use backup (PENCIL & PAPER.SYS).

15. User error: Replace user.

16. Windows VirusScan 1.0—Windows found; Remove it? (Y/N)

17. Your hard drive has been scanned and all stolen software titles have been deleted. The police are on the way.

Thanks to the Internet's "Joke A Day," as reprinted in the November 1998 ARNS Bulletin.

Credit Cards

ARRL not in the credit card business: Some League members recently have reported receiving solicitations from telemarketers for a credit card offering to radio amateurs. The ARRL is not involved with these solicitations nor has the League sold members' names, addresses, or telephone numbers to telemarketing organizations.

Thanks to the September 1999 issue of the Chicago FM Club's Newsletter, Squelch Tale.

Noah and the Ark

The Lord spoke to Noah and said, "Noah, in six months I am going to make it rain until the whole world is covered with water and all the evil things are destroyed. But, I want to save a few good people and two of every living thing on the planet. I am ordering you to build an ark."

And, in a flash of lightning, he delivered the specifications for the ark. "OK," Noah said, trembling with fear and fumbling with the blueprints, "I'm our man." "Six months and it starts to rain," thundered the Lord. "You'd better have my ark completed or learn to swim for a long, long time!" Six months passed, the sky began to cloud up, and the rain began to fall in torrents. The Lord looked down and saw Noah sitting in his yard, weeping, and there was no ark.

"Noah!" shouted the Lord, "where is My ark?" A lightning bolt crashed into the ground right beside Noah. "Lord, please forgive me!" begged Noah. "I did my best, but there were some big problems. First, I had to get a building permit for the ark's construction, but your plans did not meet their code. So, I had to hire an engineer to redo the plans, only to get into a long argument with him about whether to include a fire-sprinkler system.

"My neighbors objected, claiming that I was violating zoning ordinances by building the ark in my front yard, so I had to get a variance from the city planning board. Then, I had a big problem getting enough wood for the ark, because there was a ban on cutting trees, to save the spotted owl. I tried to convince the environmentalists and the U.S. Fish and Wildlife Service that I needed the wood to save the owls, but they wouldn't let me catch them, so no owls.

"Next, I started gathering up the animals, but got sued by an animal rights group that objected to me taking along only two of each kind. Just when the suit got dismissed, the EPA notified me that I couldn't complete the ark without filing an environmental impact statement on your proposed flood. They didn't take kindly to the idea that they had no jurisdiction over the conduct of a Supreme Being.

"Then, the Corps of Engineers wanted a map of the proposed flood plain. I sent them a globe! Right now, I'm still trying to resolve a complaint with the Equal Opportunities Commission over how many minorities I'm supposed to hire.

"The IRS has seized all my assets, claiming that I am trying to leave the country, and I just got a notice from the state that I owe some kind of use tax. Really, I don't think I can finish the ark in less than five years." With that, the sky cleared, the sun began to shine, and a rainbow arched across the sky. Noah looked up and smiled.

"You mean you are not going to destroy the world?" he asked hopefully.

"No," said the Lord. "I'm too late — the government already has."

Thanks to the September 1999 Squelch Tale.

LETTERS

From the Ham Shack

Tomes Theodorelos, San Diego. I have heard many of the reasons and the regrets about the decline in the number of new ham licenses being issued. I would like to add my observations. I held one of the old 1-year Novice licenses in the late 1950s, and I had many pleasant contacts with hams who would go out of their way to help newcomers. I am sure most hams are that way even now, but I think the "gatekeepers" may be having trouble with being friendly and helpful.

I have been planning to get another Novice license so I looked up "Ham Radio" in the San Diego Yellow Pages. I saw the listing for a store which I had visited without pleasure several years ago. I thought I would try again. However, I was quickly reminded of the cold reception I had on my first visit. There were two people behind the counter who could take the first- and second-place prizes for cold and unfriendly to all but the customers whom they knew by name.

It's too bad, since this seems to be one of the largest ham radio supply stores around. Judging from their ads in *QST*, they are probably one of the first places a prospective ham might try to look around. While I was in the store, one of these counter persons remarked to one of their customers how ham radio was going down, "never to return."

It seemed almost prophetic coming from him, especially since people like him must be contributing to the demise. I wonder if the new equipment manufacturers have the same attitude: "Here's the stuff. If you want it, OK. If you don't, we couldn't care less." I will never patronize any store in that chain in the future, and even though it would help your advertising revenue, I'm glad not to see their ads in *73*. Thanks for all you are doing to promote ham radio, Wayne.

Gregg Hoover W8GH. In the latest *CQ* Washington Readout column, Frederick Maia W5YI chastises as stubborn hams who oppose the illegal SSN demand with an erroneous and misleading analysis of the Debt Collection Improvement Act of 1966. He overlooks or ignores the word "and" between parts D and E of the Act, and the key importance of part E.

The essential facts are as follows: Licensees are not, as FCC amateur fact sheet 206.pdf asserts, automatically doing business with the FCC simply by having a FCC license. Having a FCC license is only one of two conditions that must be met to classify a person as doing business with the FCC under the Debt Collection Improvement Act of 1996. Before a person is considered to be doing business with the FCC, the person must also be in a relationship with the FCC, such as a cosigner or insurer of a loan administered by the FCC, which could make that person responsible for repayment of the loan if defaulted upon by the original borrower.

The relevant part of the Debt Act is: (i)(1) IN GENERAL. Section 7701 of title 31, United States Code, is amended by adding at the end the following new subsections: (c)(1) The head of each Federal agency shall require each person doing business with that agency to furnish to that agency such person's taxpayer identifying number. (2) For purposes of this subsection, a person shall be considered to be doing business with a Federal agency if the person is: (A) a lender or servicer in a Federal guaranteed or insured loan program administered by the agency; (B) an applicant for, or recipient of, a Federal license, permit, right-of-way, grant, or benefit payment administered by the agency or insurance administered by the agency; (C) a contractor of the agency; (D) assessed a fine, fee, royalty; or penalty by the agency; and [NOTE — G.H.] (E) in a relationship with the agency that may give rise to a receivable due to that agency, such as a partner of, a borrower in, or a guarantor of a Federal direct or insured loan administered by the agency. (3) Each agency shall disclose to a person required to furnish a taxpayer identifying number under this subsection its intent to use such number for purposes of collecting and reporting on any delinquent amounts arising out of such person's relationship with the Government.

Before the Debt Act amended section 7701, only loan applicants were required to provide an SSN.

It is wrong to say that E is just a fifth condition like A through D. The word "or" would have been used, not "and." It is also wrong to say that all hams are indeed in just such a debt relationship envisioned by E, since, as ARRL editor David Sumner K1ZZ says, all amateurs are subject to monetary forfeiture under 47 USC 503, and the "such as" language in E is illustrative, and not limiting. Aside from the shameful absurdity of Mr. Sumner's statement, it is incorrect because the FCC can fine any person under 47 USC 503. If a person is in a potential debt relationship because the FCC can fine him under 47 USC 503, then all persons, licensees or otherwise, are already automatically in an E relationship. Why would Congress add part E, giving examples of persons in a relationship, if all persons were already in such a relationship?

The language in E can honestly, rationally, and legally only be read as limiting. When Congress intended language of the Debt Act to not be limiting, it specifically stated so as it did in section (h): (h) Section 5514 of title 5, United States Code, is amended: (A) in subsection (a): (i) by adding at the end of paragraph (1) the following: All Federal agencies to which debts are owed and which have outstanding delinquent debts shall participate in a computer match at least annually of their delinquent debt records with records of Federal employees to identify those employees who are delinquent in repayment of those debts. The preceding sentence shall not apply to any debt under the Internal Revenue Code of 1986. Matched Federal employee (note) records shall include, but shall not be limited to, records of active Civil Service employees government-wide, military active duty personnel, military reservists, United States Postal Service employees, employees of other government corporations, and seasonal and temporary employees.

FCC amateur fact sheet 206 makes no mention of the additional requirement in E. The FCC is administering ULS registration as if the word "and" between parts D and E of the Act was not there. To the FCC, Congress put the additional requirement there, but for no legal effect. If E has no legal effect, why do any other parts of the Debt Act have legal effect?

But, it does have major effect and is of key importance in a debt collection act. It should not seem strange that a Debt Act would include a requirement for potential debt. For persons without a potential debt situation, it makes no sense for the Congress in a debt collection act to compel the FCC, or any agency, to treat them as if they were until such a condition arises. That is why Congress restricts agencies like the FCC from the SSN/TIN requirement with E. Until a person falls under one or more of

Continued on page 57

Need a UHF Dipper?

Part 1: Old TV tuners to the rescue!

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There are periods of time in the life of a ham experimenter when he needs a dipper to identify the resonant frequency of an RF circuit. Dippers, both tubed and solid state, have been around for many years to assist in the identification, but most cover the frequency bands from about 2 MHz to 250 MHz. There are dipper designs available for frequencies above 250 MHz, but they tend to be difficult to build with any reliability. Another problem involved is that the external sense loop for most dippers is too short when operated in the UHF region. The loop is the resonant circuit for the oscillator and is also used for probing an unknown resonator. Being short, it fails to reach very far, making the dipper very awkward to use.

I was in need of a 450 MHz dipper and began a search for a suitable device. It occurred to me that most any stable oscillator would work if it was operating at the desired frequency. One solution that was available to me was an old solid state UHF TV tuner. The one that I chose as a candidate for the dipper project was one of the mechanically variable variety as shown in **Fig. 1**. The frequency range of the oscillator is typically 470–900 MHz, which means that some modification would be required to shift the lower frequency into the 450 MHz ham band. But the first objective was to prove or disprove the theory that the tuner would be a suitable candidate for a dipper project. At this point, a number of tuners have been modified to function as dippers, with each being an interesting adventure. The one objection with most typical dipper designs has been the short external sense loop when used at UHF. Using the TV tuner as a dipper, the sense loop can be extended for probing an unknown circuit.

Varactor-tuned UHF tuners were examined as dipper candidates, but were abandoned temporarily in favor of the old mechanical versions. However, the

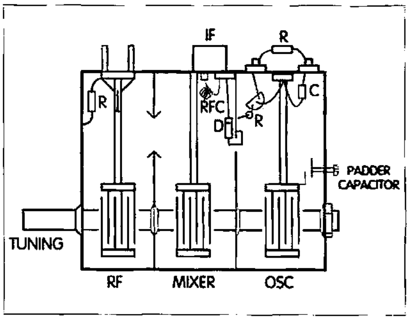


Fig. 1. Typical mechanical UHF TV tuner.

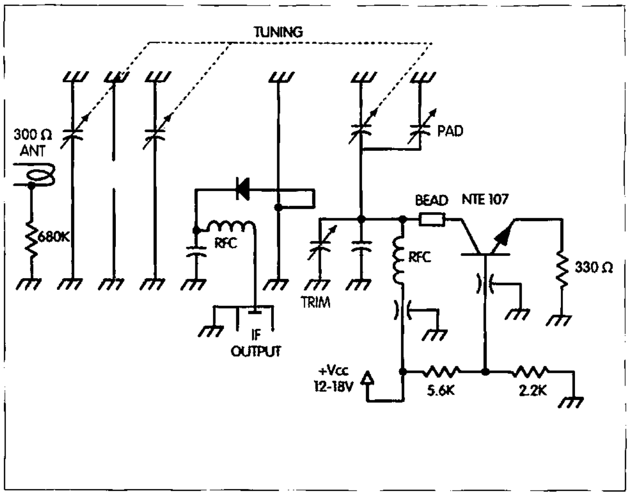


Fig. 2. Typical schematic for a mechanical UHF tuner. A varactor, if used in the tuner, is connected in parallel with the "trim" capacitor.

varactor versions appear to show some promise and will require some further investigation of feasibility.

The simple electronic circuit of the mechanical tuner, as shown in **Fig. 2**, makes the tuner very adaptable for dipper projects. Only minor modifications along with some experimentation are required to use the tuner as a dipper covering the stock frequency range of approximately 670–900 MHz. From my experiments, I know that some tuners can be coaxed to operate up into the lower portion of the 902 MHz band. I managed to get one to move up to about 928 MHz. However, my effort has been to lower the operating band for the tuner to function within the 450 MHz band. After modifying several tuners, I've found that some tuners move easily into the band while others are very stubborn and require "surgery." It is my suggestion that a tuner be made to operate in the stock configuration as a dipper, to evaluate its characteristics, before any surgery is considered or performed. The modifications can be performed progressively, with surgery only as the very last resort.

The local oscillator and diode mixer are really the only components of interest in the tuner, when used as a dipper, so the rest of the assembly can simply be ignored. When using the tuner as a dipper, the mixer diode is used as the RF activity sensor and is capable of driving a microammeter.

Testing a tuner involves measuring the operating frequency of the local oscillator. In the absence of a sensitive counter, spectrum analyzer, or calibrated receiver covering the frequency band, alternative and less exacting measurement methods must be employed.

During my early experiments in the UHF spectrum, specialized test equipment was unavailable to me; I'll assume that you are in the same predicament. To get over the hurdle of frequency measurements, some relatively simple techniques may be employed. But the methods require some ingenuity, patience, and project construction.

The two handiest pieces of equipment that got me started were the construction of a set of Lecher wires and

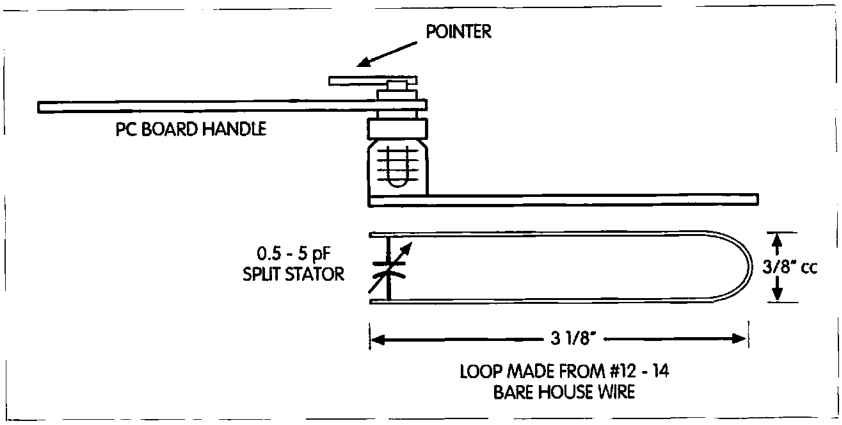


Fig. 3. Construction of an absorption wave meter tunable in the 400–500 MHz band.

an absorption wave meter. Both are resonant circuits that can be calibrated during the tuner's testing process. In use, the Lecher wires are used to determine the frequency of the oscillator; then the oscillator, as a dipper, is used to calibrate the wave meter. The reason for having two pieces of equipment is to end up with a single measurement device — a calibrated absorption wave meter. Successive frequency measurements will allow the wave meter shown in **Fig. 3** to be calibrated, and from that point on, the wave meter may be used for checking the dipper's response.

Lecher wire system

To get started in the absence of other frequency measurement equipment, it is necessary to construct a set of Lecher wires as shown in **Fig. 4(a)**, where there is a lot of freedom in the construction. This means that available material from the "junk box" is suitable. When constructing the Lecher wire system, there are only three important factors: (1) keep the wires taut; (2) have the wires close to the measurement scale; and (3) have a readable scale. The objective of keeping the wires taut is to enhance measurement repeatability. Wires do tend to stretch, so copper wire is OK, but may not be your first choice. As an alternate, iron or steel wire may also be used. Wire diameter and insulation are immaterial. In other words, enameled wire may be used without removal of the enamel. When using the Lecher wires, a narrow metal edge, such as a screwdriver shaft, is laid across the wires and then moved fore and aft, locating two points one half-wave wavelength apart. The operating frequency can be determined by placing the measured distance between the points into an appropriate equation. A block of insulating material, as shown in **Fig. 4(b)**, is rubber banded to the screwdriver shaft. The purpose of the block is to help maintain the wire spacing. Actually, the use of the block is optional when only light pressure is applied against the wires.

Perhaps the measurement scale is the easiest to make. Photocopies of a yardstick or meterstick will yield paper scales that may be glued to the board. The resulting measurements will be reasonably accurate, and that's the bottom line. **Figs. 5** and **6** show the method used and the appropriate equations as they apply to making a frequency measurement with Lecher wires.

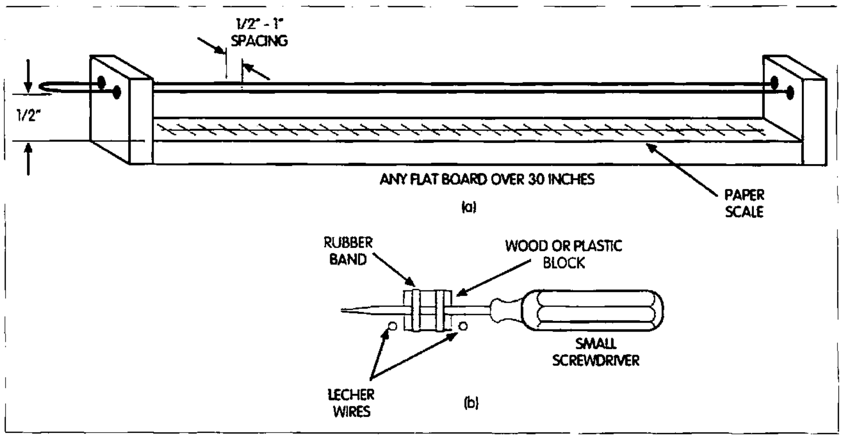


Fig. 4(a). Construction of a Lecher wire system. Wires are stretched tight.
Fig. 4(b). Use of a screwdriver as a shorting bar. Block is used to help maintain wire spacing.

Theory of resonator operation

Before making any modifications to a TV tuner, the theory regarding the internal resonator needs to be discussed so that the modification process will make more sense. Resonators used at lower frequencies are made up of a coil and capacitor, but as the operating frequency rises, the lumped inductance and capacitance of the coil and capacitor becomes distributed and less definable. In the case of the older UHF TV tuners, a quarter-wave wire having distributed inductance and capacitance is used within a channel as the basis for a resonator. The resonator may be likened to that of a quarter-wave antenna element as shown in **Fig. 7**. It is important to observe the E (voltage) and I (current) fields that exist around the element, as these fields are affected by the surrounding environment, and specifically by the variable capacitor at the top of the element. The resonator element may be identified as a metal strip or wire enclosed in the channel. The resonator is at RF ground on one end, with a variable capacitor on the other end. The capacitor operates as capacitive top loading on the open end of the resonator, as shown in **Fig. 8**.

Not shown in a figure is the effect of capacitive bottom loading on the resonating element. Some tuners utilize a varactor diode on the bottom of the element to trim the frequency as a result

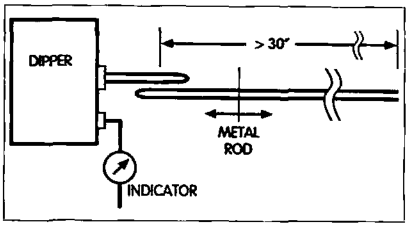


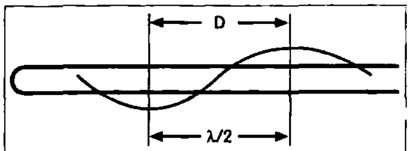
Fig. 5. Lecher wire system for measuring the frequency of a dipper.

of an applied variable voltage. Also, some tuners have a trimmer capacitor in parallel with the varactor for the initial setting of the operating band. Decreasing the bottom loading capacitance raises the operating frequency and, likewise, increasing the capacitance lowers the frequency.

Of concern is the effect that the capacitance loading, both top and bottom, has on the E-field of the resonator, because the results will guide us during the consideration for modifying the resonator. The worst case scenario is shown in **Fig. 9**, where the capacitive top loading has been increased to the point where the resonator changes mode from a quarter-wave to a half-wave element. When that happens, the resonator is essentially operating at twice the original frequency. Although this might be a desirable condition for some tuner applications, it isn't likely to happen. Also, the electronic circuit attached to the resonator may not support the mode change because of the drastic shift in transistor feedpoint impedance.

Oscillator

A transistor is connected to the RF ground end of the resonator and functions as a Colpitts oscillator driving



$$F(\text{MHz}) = \frac{5905}{D\,(\text{inches})}$$

$$F(\text{MHz}) = \frac{15000}{D\,(\text{cm})}$$

Fig. 6. Determining the approximate operating frequency using a Lecher wire system.

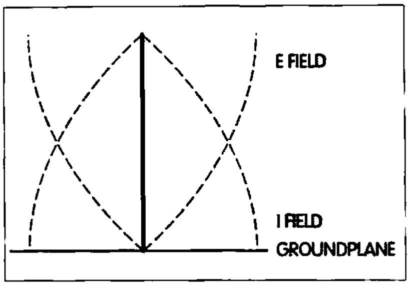


Fig. 7. Quarter-wave resonator with voltage and current fields shown.

the resonator. With the transistor connected as used in the TV tuner, it is matched to the bottom of a quarter-wave element. But when the element is excessively loaded, the transistor will fail to oscillate because of a loss of feedback. In most cases, the oscillator will stop oscillating when too much capacitive loading, top or bottom, is applied. A simple explanation for the loss is the drastic imbalance of "feedback capacitance" vs. "loading" capacitance. Decreasing the loading capacitance will usually allow the oscillator to restart. The stopping and starting action of the oscillator may be monitored by observing the meter attached to the mixer diode. Sometimes an increase in oscillator feedback will assist in sustaining oscillation even with a heavy element load.

Metering circuit

Most of the tuners that I've modified for use as dippers have provided about 2 mA of current when the oscillator is operating. At that current level, most any analog panel meter having a full-scale current value less than 2 mA will work well in the dipper application. But to keep the oscillator loading to a minimum, I'd suggest keeping the actual meter current as low as possible, perhaps in the 50–200 μA range. A suitable pot may be included in series with the meter to provide a meter level adjustment as shown in **Fig. 10**.

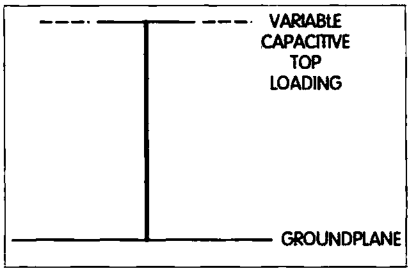


Fig. 8. Quarter-wave resonator with variable capacitive top loading.

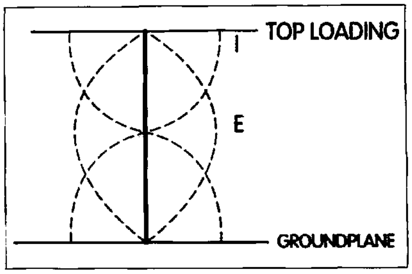


Fig. 9. Excessive capacitive top loading forces a quarter-wave element to operate as a half-wave element.

Another thing that I've observed with tuners is that the polarity of the mixer diode varies from tuner to tuner. Of course, the reason is obvious because when used as a mixer, diode polarity is immaterial. Should the diode's polarity need to be reversed, then care must be taken during the modification process because excessive heat can damage the diode. Regardless, the tuner-dipper project is not dependent upon the diode polarity. Just select the meter's polarity to match the diode.

Some tuners have an RF choke from the mixer jack to ground. One end of the choke must be opened to allow the diode current to pass through the meter.

Part 2 of this series will continue with a discussion of the sense loop schemes and testing. Part 3 will describe the modifications that can be used to permit using the tuner as a dipper.

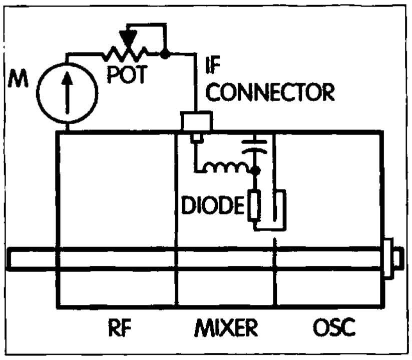


Fig. 10. Using a microammeter as the oscillator's activity monitor/dip indicator. A pot is used for adjusting the indication level.

HT Porta-Power Project

A neat and portable extended power package for handhelds.

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There are times in amateur radio operations when it would be nice to have the convenience of a hand-held (HT) transceiver, yet still be able to have power other than the HT's own battery pack available. This external power source would have to provide power for an extended period of time for prolonged HT operation. Also, the external source must be portable. If that were not enough, this whole package would have to be easy to configure for stand-alone HT usage as well as for extended operating applications. And going even further, the entire package must be put together without any costly specialized packaging fabrication.

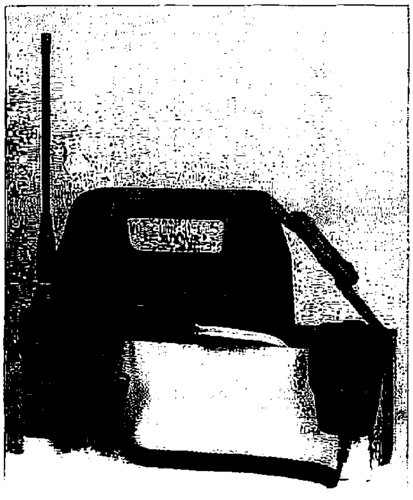

Photo A. An external power package for your HT.

The solution lies in finding rather readily available materials and supplies that commonly would not be thought of as usable in this application. Let's take a look at the various items it takes to put this package together. First, we need a portable yet high capacity DC power source. Second, some sort of container to hold the various pieces together. And lastly, the entire mélange has to be fastened together in some sort of integrated package, which can be easily transported with one hand.

External DC power source

For this, I chose the Power Station, as sold by The Ham Contact. It fit the bill regarding both high capacity and easy portability. It is a neat package in itself. It supplies 12 VDC as well as 9, 6, and 3 VDC. The 12 VDC output is accessible via a front cigarette lighter receptacle, in addition to positive (+) and negative (-) terminals on the rear of the unit. The unit contains a 12 V, 7 Ah sealed battery, which will provide nicely for extended HT usage. A built-in meter reads the voltage of the 12 V, 7 Ah battery, and is marked for easy determination of when the battery needs to be charged. Two charging options are included in the unit. It may be charged from an AC outlet or from a DC source such as the cigarette lighter of a vehicle. Both charging cords are supplied.

The box to hold it all

This should not be rocket science, but trying to find an appropriate container without custom building one took some searching. The belt clip on the HT was to be utilized to affix the HT to the box. The wall thickness of the box could not be too great, as it had to accommodate the HT belt clip. Readily available plastic containers had a rolled-type edge, which would not allow the belt clip to be attached because the edge thickness was too great. What did work was a wooden box used to hold compact discs (CDs). The box has a wall thickness of about

Continued on page 39

FM CW!

Bring on those repeater code-practice sessions ...

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Streamwood IL 60107

Recently, my friend Dave N9ZAZ mentioned a CW net he had joined that presented a unique challenge: The CW was being sent via an FM transceiver. How could it be done without the operation becoming a hopeless kluge?

Initial attempts included holding a microphone next to a sidetone oscillator and keying the oscillator with the other hand. This method proved rather cumbersome, and the background noise sent along with the CW could be distracting.

Feeding the sidetone oscillator directly into the microphone's audio input was a step in the right direction, but was still lacking. How could a sidetone oscillator do everything—send a tone, and key (and unkey) the transceiver—all without the need to go out and buy a new (and much more expensive) transceiver?

I developed the circuit shown in **Fig. 1** and hooked it in parallel with the microphone, so that either the microphone (for FM operation) or the CW circuit could be used without having to unplug one while using the other. The first half of a monostable oscillator (U1A) was wired in a retriggerable mode. The CW code key will trigger its timing cycle, set for approximately two seconds. This will allow enough

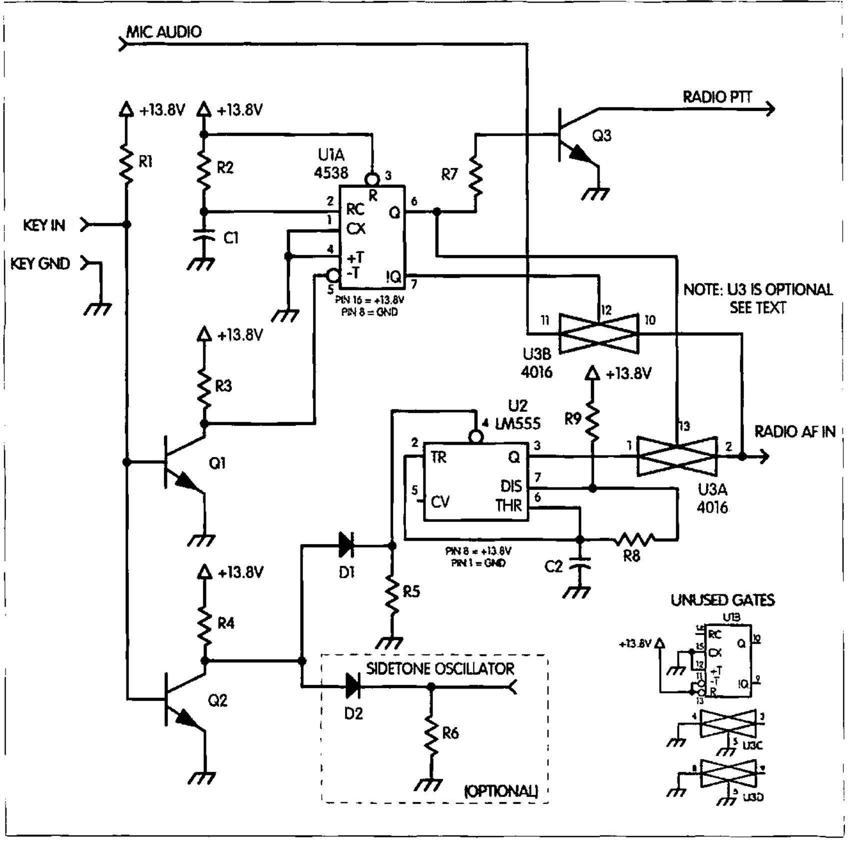

Fig. 1. Schematic.

time (space) between CW words so as not to run them together without the transceiver toggling from transmit back to receive (the transceiver is toggled into transmit via Q3, driven by oscillator U1A).

At the same time that U1A toggles the radio into transmit, it disables the microphone audio via U3B. This avoids having stray audio creep into the transmit audio, as well as having the microphone's impedance affect CW operation.

U2, a 555 oscillator set to run at about 1 kHz, is triggered at the same time as U1A. The 555 oscillator is fed to the transceiver's audio input through U3A, a second analog switch that, in this case, isolates the 555 when the microphone is used for FM operation.

When CW operation ceases, U1A times out (allowing the transceiver to toggle back to receive), enables the microphone audio through U3B, and isolates the CW circuit's audio through U3A.

If the operator wishes to monitor his/her own signals, U2 can be conveniently duplicated, with pin 4 being wired to the junction of R6 and D2.

I built the prototype circuit with a microphone jack at one end, so that the radio can be used either with FM or CW without having to unplug either the CW circuit or the microphone for operation in the other mode. A short "pigtail" wire with a microphone plug, an on/off switch, a power connector, a speaker, and key jacks completed the enclosure.

For ease of operation, this circuit is powered from the same power supply used for the mobile transceiver. To help ensure clean operation, the circuit was mounted in a small metal enclosure with the enclosure tied to ground, and a small filter capacitor was soldered across all input and output leads (this is optional, depending upon the amount of stray RF in your ham shack). The only adjustment that may be required is a resistor in series with the line from pin 3 of U2 to the radio's microphone audio input. This will allow you to set the deviation of the transmitter to the appropriate level. I've found that 100 ohms works quite well, but the value may vary slightly depending on the internal settings of your radio.

Parts List

Qty.	Name	Description
1	C1	22 µF
1	C2	0.0 µF
2	D1, D2	1N914
3	Q1, Q2, Q3	2N2222
6	R1, R3–R7	4.7 k
1	R2	100 k
2	R8, R9	3.6 k
1	U1	4538
1	U2	LM555
1	U3	4016

Table 1. Parts list.

FYI: FQY

Another look at the Fractal Quad Yagi.

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While moving several times during the last few years, I had to leave behind my previous antennas and masts. Thus, when we finally arrived at a QTH that was more or less permanent, it was time to start over from scratch. Scratch is a good term to describe my ham budget, too. I began looking for an antenna design that fit the following criteria:

1. Use of available materials at reasonable cost (free is good).
2. Small enough to fit on an easily erected mast and rotate with a TV rotator.
3. Better gain than the existing vertical antennas I already have.
4. Good directivity to limit QRM.
5. Low radiation angle to work DX.

Since 10 meters is now opening up, I decided to stick to a single band antenna for simplicity's and cost's sake.

While surfing the Internet for antenna ideas, I stumbled across Chip Cohen N1IR's Web site, [www.fractenna.com]. I was intrigued with his Fractal Quad Yagi (patent pending) because of its small size and ease of construction. I decided to put one together just to find out whether such a design had merit.

Design

As described on Chip's Web site, the 10 meter FQY is similar to a cubical quad in shape, but is in a smaller form. In fact, the elements are a little over 4 feet per side. He claims impedance to be close to 50 ohms, so it can be fed directly with 50 ohm coax. It has 3 dBd gain, front-to-back ratio in excess of 25 dB, and a bandwidth of 500 kHz for less than 2:1 VSWR.

He also describes construction of a 10m FQY built by Phil N1ZKT, using #9 aluminum ground wire (available from Radio Shack), and plastic water pipe for spreaders. I followed his construction method as much as possible. Along the way I did some work of my own, such as coming up with equations for scaling the driven element for different frequencies (like designing for the CW band). Although Chip's design was simplified to allow duplicate driven and reflector framework, I tried to enlarge the reflector and do away with a stub, although as seen in the photo, a small stub had to be added later to tune the reflector.

For purposes of folding the wires, each length between bends is broken up into segments, the total of which equals the length of each element. **Fig. 1** shows the length for each segment of 1/4 of the element, the same pattern repeating for the other three sides. Unlike the figures published on the Fractenna Web site, the figures in **Fig. 1** go from the attachment point of the feedline to where the element again comes closest to the boom, this being the logical starting point for the end of the wire. You should also note that these figures will hold for #9 wire only. Adjustment will have to be made if you are using a different wire diameter. As far as spacing between elements goes, I had available a 10-ft. piece of aluminum pipe and I figured I could experiment with different spacings. The results shown here are for 6.5-ft. spacing, wider than Chip's 4.5 feet.

Construction

The first part of building the FQY consists of fabricating a framework to hold the elements. As I had experience constructing quads, this part was fairly simple. Although spiders could be constructed of nonconductive material to keep metal away from the near field of the elements, I used aluminum, as

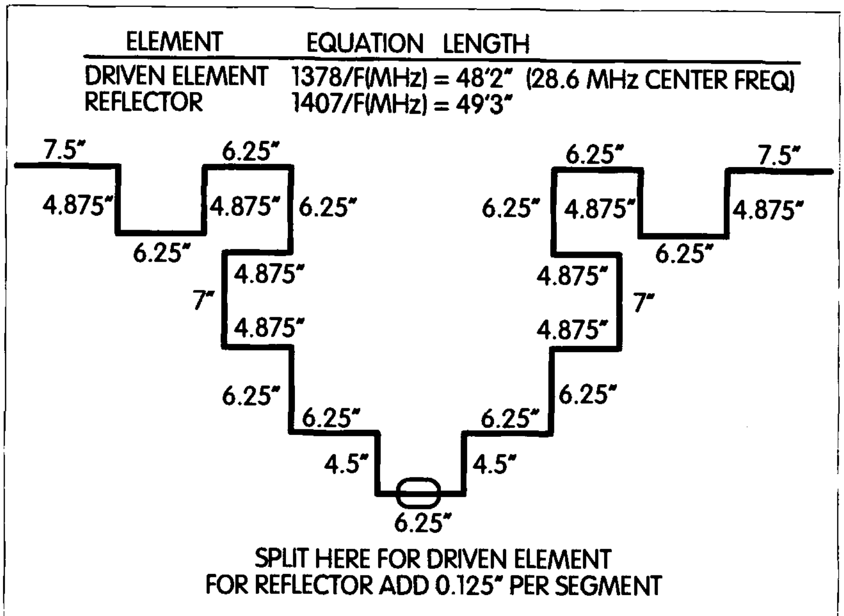

Fig. 1. Segment chart, one side (with feed).

that's what I had available. In fact, as the photo shows, some spiders are fabricated from surplus extruded aluminum from a discarded window. The spiders are drilled to accept muffler clamps the size to fit the boom, and spreaders are attached using hose clamps. You may have to cut notches as I did to allow the hose clamps to secure the spreaders tightly. Spreaders are constructed from 1/2" plastic water pipe. Cross pieces to hold the elements are then constructed from 1-1/4" plastic pipe cut to 5" length. A 7/8" hole is then drilled through the side to allow the spacer to slide down the spreader. A screw can be drilled into each spacer to hold it in position on the spreaders once the elements are mounted. A hole is then drilled in the end of each spreader large enough to pass a cable tie through to hold the outside corners of the element. An alternate spacer having a smaller silhouette could be fabricated from 1/2" plastic pipe by cutting a notch in the center and mounting to the spreader with a screw.

Once the framework is built, the elements can be bent and mounted. First, the total length of the element should be measured on the wire. If you use Radio Shack wire, it comes in 40-ft. lengths, so wire will have to be added to complete the element. Then a mark should be made at each 1/4 section of the wire. Next, a wooden block marked with the length of each bend is used to measure off the segment length and the wire is bent around the corner of the block to a 90 degree angle.

Care must be taken to bend the wire in the correct direction to form the pattern. I found that the best way to make accurate bends is to bring the center of the wire from the previous bend even

Materials List

Qty.	Item
3	40-ft. rolls #9 Radio Shack aluminum ground wire
1	bag of 100 8-in. cable ties
4	x 10 ft. schedule 40 1/2-in. plastic water pipe
1	x 10 ft. schedule 40 1-1/4-in. plastic water pipe
1	x 6 ft. aluminum angle or equiv.
1	x 6.5 ft. 1-1/2-in. aluminum pipe
4	2-in. muffler clamps

Table 1. Materials list.

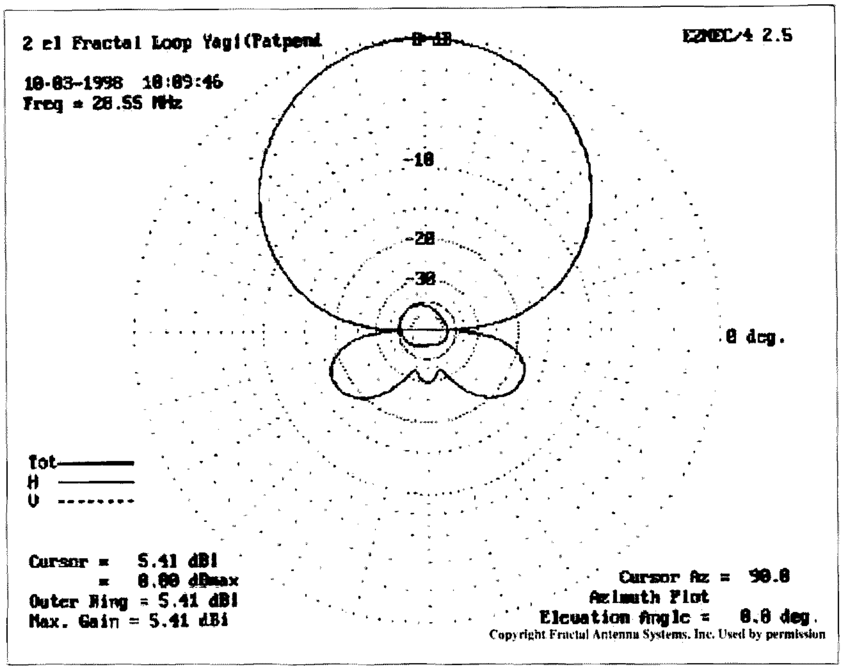

Fig. 2. Azimuth plot: Chip's free space azimuth plot. My version showed no lobes off the rear corners and a front-to-back of 12 dB.

with the mark, and then make the next bend. As the wire is bent, it will draw the previous bend forward to bring the outside edge of the wire even with the mark so that the outside edge of the previous bend to the inside edge of the next bend equals the segment length. As each quarter section of the element is finished, the mark made previously on the element can be used to judge if adjustments need to be made in bends. In this way, a full element should be able to be constructed with a minimum of rebending.

If aluminum ground wire is used, a suitable connection will be needed at the wire ends. After several trials, I settled with the method of crimping a solderless eye terminal to each end of the wire. Then connection is made with a #6 screw through the eyes and tightened with a nut and tooth washer.

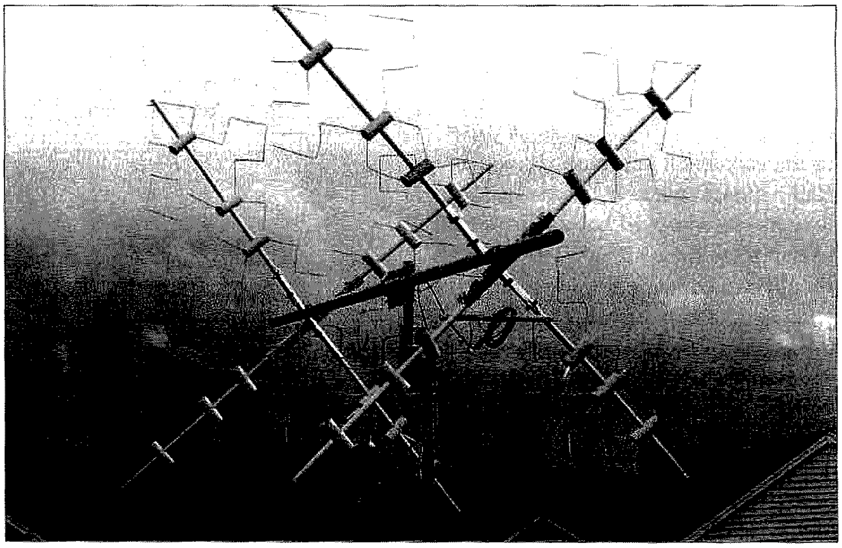

Photo A. *The 2-element FQY mounted at the author's home. The element spacing here is 6.5 feet.*

Once the elements are completed, they can be attached to the spreaders. This can easily be done by laying the element on a flat surface and overlaying the framework. Attach the element corners with cable ties first, and then attach the rest of the corners to the spreader spacers with cable ties. Once the element is attached, the cable ties can be trimmed and the spacers locked down with a screw.

A mount at the feedpoint can be made with a piece of 1/2" plastic pipe cut to fit between spreaders and attached with screws. A balun or coaxial choke should be used at the feedpoint to prevent radiation from the feedline.

Results

With the FQY at 10 feet, measurements of VSWR were taken with the internal SWR meter on my ICOM 740. Resonant frequency was about 300 kHz lower than that shown, but bandwidth was about the same. Had I worked out the procedure above beforehand, I probably would not have had to adjust the driven element, but as this was the first attempt, trimming and rebending of wire ensued.

Tuning the reflector for front-to-back resulted in a best of 12 dB via ground wave. Chip informs me that increasing the boom length will decrease the modeled F/B and broaden the bandwidth to 800 kHz, more in keeping with my results.

A shortened boom length will increase the F/B as in Chip's version. The F/B stayed about the same with the antenna at 24 feet. It should also be noted that testing with sky wave signals resulted in a figure closer to 30 dB, actually better than the claimed 25 dB. I had no way to measure the forward gain empirically, so no figures are given here. However, recent testing by K1KW confirmed the results modeled by Chip as far as gain and F/B went, measuring against a reference antenna.

After verifying SWR and front-to-back, it was time to give the FQY the real test. How does it do on the air? With the antenna still at 10 feet, I started tuning across the band and heard VK2ARJ calling. I gave him a

Photo B. Bending the wire around a wooden block. The block is marked for the different length bends.

call and got a 5-5 signal report with 100 watts. This was encouraging. After finding and fixing a used TV rotator, a 10-ft. mast was installed on the roof and the antenna mounted. This got the boom height to 24 feet.

Many contacts were made over the next two weekends, including V63KU, H4OMS, BV5BG and A35RK. I also happened to catch a rare aurora opening to Europe at 2300 UTC, working OZ1GML, GM4WJA, OZ6MI, SMØFLY, and GØMJS. Two things began to become apparent. First, this antenna seems to radiate very well at low radiation angles. In doing comparison tests with a ground-plane vertical at 14 feet with stateside contacts, very little difference is noted between the FQY and the vertical, usually less than 2 S-units, depending on condition. However when the FQY and the vertical are compared on long haul contacts, say to Australia, the FQY performs much better than the vertical, on the order of 5 to 6 S-units. Most times, a signal that can be easily heard on the FQY is a struggle to copy on the vertical.

Second, the FQY seems to transmit better than it receives on long-haul DX. I consistently receive signal reports that are 1 to 2 S-units better than I am hearing. Stateside contacts usually are about the same on transmit and receive.

Front-to-back on sky wave paths is better than measured on ground wave also. Measurements made over time indicate the F/B is well over 20 dB, most times dropping an S9+20 signal to below S5. The same signal will drop to below S1 off the sides, indicating deep nulls.

The best test came during the *CQ* WWDX contest. At one point I started at the bottom of the phone band and called every DX signal I could hear up to where the signals quit. Although I didn't work every station on the first call, I did work every station. The toughest was CEØAA on Easter Island. He had a huge pileup, with US stations all across the country calling. It took quite some time, but I happened to catch an opening as his signal was coming up, and finally got through. Many contacts have been made since, with comparable results.

	Chip's Version	Measured
2/1 VSWR	500 kHz	1350 kHz
	28.3 to 28.8	28.150 to 29.5
F/B	>20 dB (measured)	12 dB (see text)
Gain	3 dBd (modeled)	---

Table 2. Results.

Conclusion

I could be satisfied with this antenna just the way it is at 24 feet. It fit neatly into all my criteria listed at the beginning.

This antenna has proven itself beyond my expectations. However, for all the answers I've gotten, a dozen more questions have been raised. What would this antenna do at 35 feet? Sixty feet? Could this antenna be scaled for other bands? I already have an idea for a fractal quad loop for 40 meters. Are the results I've seen reproducible? One thing is sure: Here is a field of discovery that is open for any ham with a modicum of mechanical skill and a healthy curiosity.

Acknowledgments

I would like to thank Chip Cohen for sharing his FQY design with us hams even though it is patent pending, and for his help and encouragement in writing this article. I would also like to thank Phil N1ZKT, who first constructed the 10m FQY. His ingenuity in designing the support structure inspired me to build my own.

Number 22 on your Feedback card

Secrets of Transmission Lines

Part 3: More AC review.

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In part 2, we discussed the effects of the inductor and the capacitor, with the inductor storing energy in the magnetic field and the capacitor storing energy in the electrostatic field. By itself, neither of these effects dissipates any energy. When the magnetic field of the inductor collapses and when the capacitor discharges, all of the stored energy is given back (at least theoretically, in perfect devices). If the pendulum used as an example were operated in a vacuum so that there would be no air resistance to the swinging, and if the mount and suspension did not flex, the pendulum would swing on forever. Note that this is not "perpetual motion," in that no energy or work is extracted. It is simply a system in which no (or at least very little) energy is being dissipated, just as the Earth will continue to orbit the Sun, if not forever, at least for a very long time.

If you used a plumb bob weighing 62 pounds suspended by a 220-foot length of steel music wire with a swing arc of 10 feet, you would find that the pendulum would swing for several days from the initial impulse. This was the arrangement used by J.-B.-L. Foucault to demonstrate the rotation of the Earth. The plane in which the pendulum swings would slowly rotate in azimuth. At the north pole it would make a complete rotation in a day, and at lower latitudes it would rotate more slowly, falling to zero at the equator.

The point is that there is no real power dissipated in the imaginary components of an impedance. This point deserves a little more explanation, and is perhaps best visualized by the graph in **Fig. 1.** From our part 1 discussion of Ohm's law, we saw that power is the product of voltage times current. For the alternating current, from equation (2-8):

V_t = Vo*[sin(wt)]
eqn (3-1)

and for an inductor, from (2-11):

i = [-Vo/(w*L)]*cos(w*t)
(3-2)

Thus:

Power in inductor = -Vo*{[sin(w*t)] /(w*L)} watts
(3-3)

The plot of this equation is shown in **Fig. 1** with the crosshatched area. To simplify, we assumed (w*L) = 1. You can see that, averaged over a half cycle, the power is zero since the negative part cancels the positive part. What the inductor absorbs in the first half, it gives back in the second half.

Not so the case for a resistor. From Ohm's law, we can obtain the current through a resistor as:

i = Vo*[sin(w*t)/R] amperes
(3-4)

where
R = resistance in ohms

Multiplying by the voltage to get power, we obtain:

Power = [Vo*sin(w*t)]*{Vo*[sin(w*t)] /R} watts
(3-5)

Thus:

Power = (Vo^2)*[$\sin^2$(w*t)/R]

This curve is also plotted in the lower half of **Fig. 1.** Note that because the sine function is squared, it never

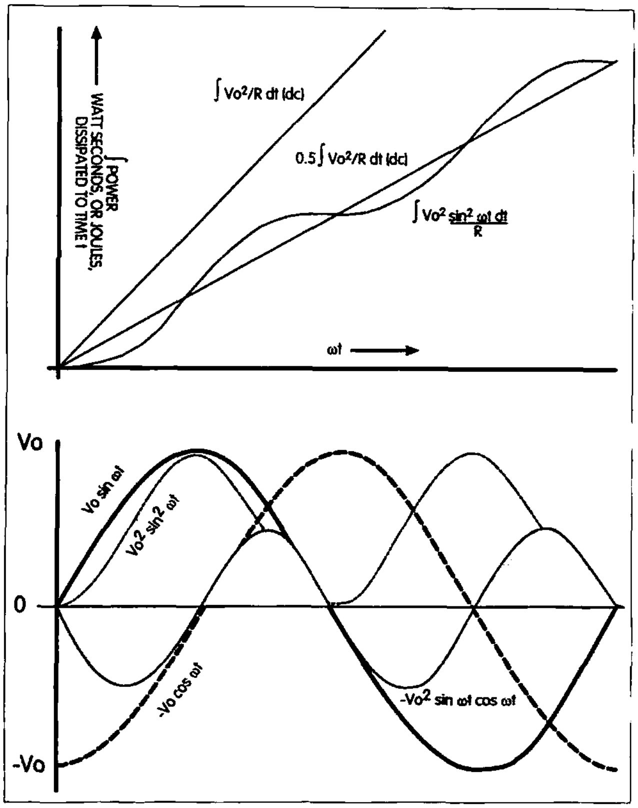


Fig. 1. The cumulative heating power with time of a resistor driven by an alternating voltage.

goes negative. This is real power that makes the resistor hot.

As shown in the sin^2 curve, the instantaneous power in the AC case occurs in two peaks per cycle, one when the voltage is maximum positive and the other when it is maximum negative. In the upper half of the figure, we show how the joules or watt-seconds accumulate for two DC cases and the AC case. If the DC voltage is equal to Vo, the power accumulates faster than in the AC case; however, at 0.5 times the DC rate, the accumulation is equal on the average. If the energy were applied to a resistor or an oven, the heating would be equal. This value of voltage is termed the Root Mean Squared value, usually written RMS or rms.

Vrms = [sqr(0.5)]*Vo = 0.707*Vo (3-6)

Note that this numeric relationship between the peak AC voltage, Vo, and the RMS voltage applies only to sine waves; other waveforms have other relationships.

A similar relationship can be used to show that a similar effect applies to a capacitor. The current flowing in the capacitor represents no real power.

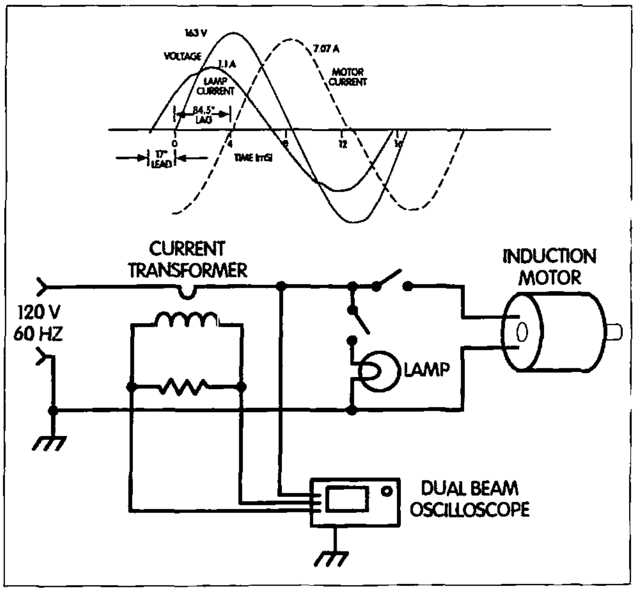
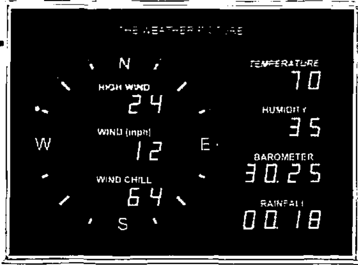


Fig. 2. Current and voltage monitoring of an induction motor.

Power factor and phase angle

All real inductors and capacitors have some loss associated with them. Therefore, the lossless circuit, where



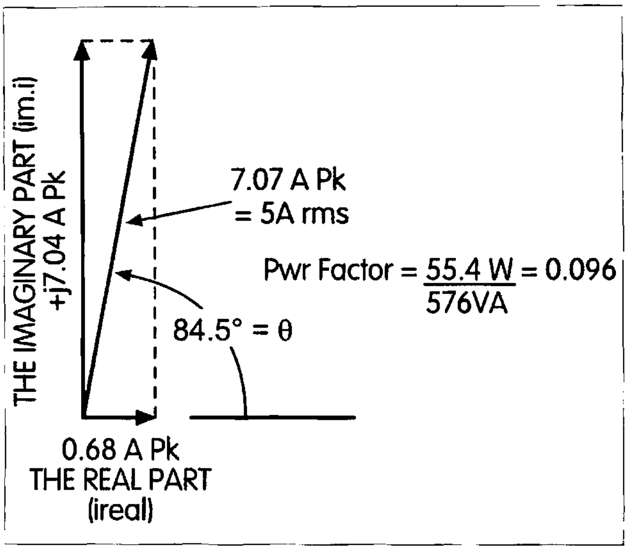


Fig. 3. The vector diagram.
Eqn (3-7) ipeak = irms/0.7071
(3-8) 0.7071(7.07) = 5 Arms
(3-9) ix (real) = ix cos θ
ix (imaginary) = jix sin θ
(3-10) Power (real) = irms (real) Vrms watts
Power (imaginary) = irms (imaginary) Vrms VARs
(3-11) Power (real) = 0.7071 (0.68) x 0.7071 (163) = 55.4 watts or 0.074 horsepower
Power (imaginary) = 0.5 (j 7.04) 163 = 574 VARs

the inductor and capacitor simply exchange energy without loss, does not exist. Let us examine a simple practical case. The curves of **Fig. 2** represent measurements made on equipment in my shop. The motor and lamp are both on a drill press.

The motor is rated at 1/3 horsepower and the lamp is rated at 100 watts. For the data in the illustration, the motor is more or less loafing, just turning itself and the tapered roller bearing quill in the drill press. In all likelihood, the main power loss is in turning the belt.

We will describe how to make the current transformer later. Suffice it to say here that the transformer can be calibrated to read so many volts per ampere and the phase angle is zero. That is, the output voltage is precisely in phase with the current (not the voltage) on the line under measurement.

Both current waveforms are slightly distorted from perfect sine waves. In the case of the induction motor, the distortion is at the crossover point and probably due to hysteresis effects. In the case of the lamp, the distortion is due to the fact that the resistance of the lamp changes throughout the cycle due to heating effects.

With a dual-trace scope, we can compare the voltage, current, and phase angle between them. The peak voltage on the line is 163 volts. Multiplying by .707 to get RMS, we obtain 115 V, which looks more familiar. Similarly, the 7.07 A peak current yields 5 amperes RMS. If we had only the voltmeter and the ammeter, we might be tempted to multiply these together to obtain 576 volt-amperes.

Referring to **Fig. 3**, we see the resolution of the currents and voltages. In equations (3-9) and (3-10), we resolve the current into the real part which is in phase with the line voltage and the imaginary part which is 90 degrees out of phase with the line voltage. At the bottom, we calculate the horsepower on the basis of 746 watts per horsepower. The power factor is simply the real power divided by the total volt-amperes.

The 0.074 horsepower does not seem to mesh very well with the 1/3 horsepower on the motor nameplate. We noted that the motor was idling. As you start to do some real drilling, say, using a half-inch drill in cast iron, the current creeps up slightly to 7.8 amps peak with a phase angle falling to 68 degrees. This gives a real current of:

i = .7071*7.8*cos(68)
i = 2.07 amperes RMS

Power is:
P = .7071*163*2.1 A
P = 238 watts = 0.319 horsepower

This is a little more in keeping with the 1/3 horsepower label. Note, however, that the Rochester Gas and Electric Company is supplying me with 7.8*115 = 899 volt-amperes, while the wattmeter is only billing me for 238 watts. There is nothing imaginary about the reactive volt-amperes. They heat transformers and wires just like the "real" power. The lamp draws leading current like a capacitor. This is because the lamp resistance goes up after the initial flow of current, so it tends to shut down before the peak of the cycle is reached. Because the phase angle is only a minus 17 degrees, the real part is:

irms = .7071*1.1*cos(17)
irms = .744 amps RMS

Power = 115.25*.744 = 85.72 watts

This is not so far off the target of the 100 watts listed on the bulb. Also, we used an RMS correction to apply to a distorted waveform. The power factor for the lamp is:

Power factor = 85.72/89.64 = 0.957

Much of the work to be done in impedance matching will be simply a matter of trying to correct the power factor of the load for efficient transfer of power.

Power factor correction

Let us suppose that we wanted to correct the power factor of the drill press. At no load, we see that the imaginary current is:

iimag = 0.707*7.07 amp*sin(84.5)
iimag= -j4.98 A RMS

Now, if we were to supply a capacitor that would draw +j4.98 A RMS, the capacitive current would cancel the inductive current and the power line input current would fall to 0.68 A RMS. From formula (2-18), we have:

iimag = V/Xc
Xc = 115.25/-j4.98 = -j 23.14 ohms

but

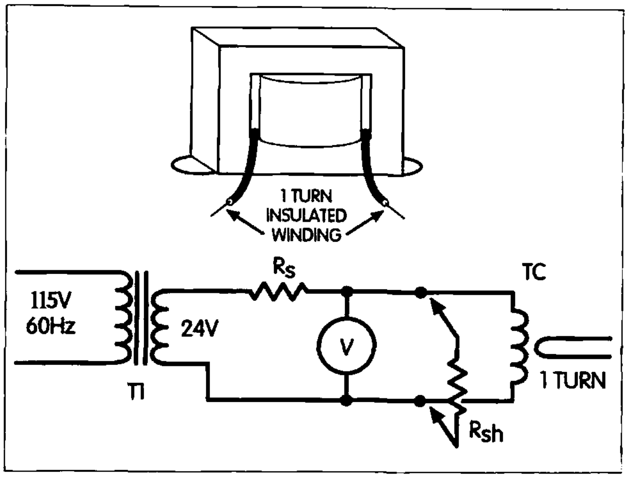


Fig. 4. The current transformer, and finding Rsh value.

1/Xc = j0.0432 mhos = w*C = 2*pi*60*C

C = 0.0001146 Farads or 114 microfarads

This is a fairly large size for a capacitor that can handle 163 volts peak AC; therefore, power factor correction is rarely attempted on small machines.

Power companies can rely upon the diversity of their loads to smooth out the power factor, but a radio antenna system cannot. It must be impedance-matched if any reasonable transfer of power is to take place.

The current transformer

The current transformer shown in **Fig. 2** makes a worthwhile project for this chapter, and it is also a handy thing to have around the ham shack. Furthermore, it will teach us some valuable lessons about radio frequency measurements.

The current transformer can be made from nearly any transformer. For convenience it should be small, but the main requirement is that there be enough room to sneak a wire through between the winding and the core.

This is illustrated at the top of **Fig. 4.** The wire passes between the winding and the core, around the back, and out the other side. The wire should be insulated and of a size capable of handling the number of amperes you expect to measure. Do not use varnish-insulated wire, since the voltage rating of this wire is too low and the varnish may be scratched through when pulling the wire between the winding and the core.

Teflon-insulated hookup wire normally has a rating of 600 V if the insulation is about 1/32-inch thick. Remember that the voltage-to-ground of the circuit whose current is being measured will appear on this wire, and you may be handling the core and attaching the trans- former to a grounded oscilloscope.

As a simple guide to wire size, a #16 wire is safe at 15 amperes. If the space between the winding and the core is too small for this, two #18 or four #20 wires wired in parallel will also serve for 15 amperes. For other ratings, you can look up the area of the wire on a wire table and assume that you can run 1000 amperes per square inch of wire cross-section. This rating accounts for heating in the transformer and is on the conservative side.

The next thing to do is to find the correct value for a shunt resistor. At the bottom of **Fig. 4**, you will see a circuit hookup. The 24-volt transformer is used as a safety measure to isolate your setup from the power line. The specific voltage used is not important; however, 24 VAC is a safe level with which to work, and 24-volt transformers are widely available. Pick a value of Rs such that the voltmeter reading is about 10% of the T1 output voltage reading, with the circuit connected, except for Rsh. If we assume that the transformer you picked out for TC is a 115 V to 24 V variety rated at perhaps 1 A output, the value of Rs will work out to be about 10k to 12k ohms. The power being dissipated in this resistor will be somewhat less than 24*24/10000 = 0.056 watts.

Now what we need is to find a value

Continued on page 26

Secrets of Transmission Lines

continued from page 25

of Rsh that will reduce the voltmeter reading by a factor of about 10. It is important that transformer TC have no load on any secondary windings. To do this, simply clip various values of Rsh across the winding and observe the voltmeter reading. When the correct value of resistance is found, solder it in place across the winding of TC.

We have been talking about the fact that the voltage drop across an inductor is in quadrature with the current, and in fact, if the voltage drop across the winding of TC is 10% of the output voltage of T1, then the phase angle of the current in TC will be only 5.7 degrees.

Without belaboring the math too much, when the winding is shunted by Rsh such that it reduced the drop across TC by a factor of 10, an interesting thing happens. The ratio of the currents in the single turn winding and the current in the secondary is given by:

Ist/I2 = (j*w*M12)/(Rsh+j*w*L2)

where

Ist is the current in the single turn winding in

I2 is the current flowing through Rsh and L2

M12 is the mutual inductance between the windings

L2 is the self-inductance of the winding shunted by Rsh

Now, if w*L2 is greater than Rsh, then we may neglect Rsh. The j*w in the numerator and denominator will cancel, and:

Ist/I2 = M12/L2

There are a couple of important things here. First of all, we note that the currents are in phase. Secondly, we see that the ratio between the primary and secondary is independent of frequency — the j*w terms have canceled out. The output voltage will be:

Vout = I2*Rsh

Now, you will probably not know the value of M12, so the ratio of the current in the single turn winding to the output voltage is best determined experimentally. If you have or can borrow an accurate AC ammeter, you can pass currents through the single turn winding and measure the voltage drop across Rsh. If you have a variable voltage source like a variac or a multi-tap transformer, you can use a single resistor. If you have only a single voltage source, you can use resistors of different resistances to obtain several calibrating currents.

The power dissipated in Rsh is:
PD = (Vout*Vout)/Rsh

This can be substantial, and Rsh should have a wattage rating that is conservative. Note that if Rsh should open up or fall off, very high voltages can be generated in L2 or other windings on the transformer. Also note that any other secondary winding can have a substantial voltage on it.

Since the single turn winding must interrupt the circuit and power line voltages are liable to be found on it, it is well worth it to have sturdy terminals to attach to the single turn winding. I have found it convenient to place the transformer in or on a conventional electrical box, and to wire the single turn winding between a conventional outlet and a conventional plug. With this arrangement, an appliance can simply plug into the box, and the box can plug into a wall outlet for current measurement without cutting any wires.

If you have an oscilloscope, the current transformer can be used to show waveshapes and phase angles.

The cancellation of the j*w terms would imply that the frequency response might extend indefinitely. As a practical matter, the frequency response of the device is probably a function of the thickness of the core laminations. With standard 0.015-inch core laminations, the response will tend to fall off at frequencies in excess of 400 Hz or so. As we shall see later, a current transformer with a ferrite or powdered iron core is a significant part of most directional couplers, VSWR meters, and automatic tuners.

To be continued.

NEVER SAY DIE

continued from page 4

with the Center for Disease Control and Prevention in Atlanta, and the State Research Institute of Virology and Biotechnology, outside of Novosibirsk in Siberia.

That's okay, too, except for some recently leaked classified reports from Russian scientist defectors who reported that while we have a few ounces of the virus, Russia has built up a stockpile of 20,000 tons and has been testing missiles with refrigerated spray biological warheads on their giant SS-18 intercontinental missiles that are targeted on the US.

There are worries that they might even sell some to North Korea, which could lob some over on Japan and virtually wipe out the country. North Korea recently fired a missile over Japan and into the Pacific, just to let the Japanese know they can do it any time they want.

As I've reported, there are somewhat less reliable reports that Iraq has built up over a hundred 11-person cells around the US that have been brewing anthrax, waiting for the command from Saddam to spray it in our major cities and from crop duster planes on smaller cities, with the goal of killing over half of all Americans in a few days. The scary part is that this is a fairly simple scheme to carry out, and we know that our government would never tell us about it since there is so little they can do to prevent it.

Is there anything you and your family might be able to do? Of course there is, as long as you don't tell too many people. The supplies of gas masks and protective clothing are scanty, so if more than a few hundred people go after them, that'll be the end of that. But since you pay almost no attention to what I write and recommend, I feel safe in writing about it here.

I've published two construction articles on the bioelectrifier. You are supposed to be an electronic hobbyist, so putting one together should be duck soup for you. But you haven't done it. If you don't have the back issues with the projects, you can spend $10 for my Bioelectrofier Handbook, which has a reprint of the Miller article, along with the original Beck blood purifier circuit. The parts cost under $20. If you are electronically challenged you can buy a Plant Growth Stimulator which, by an amazing coincidence, has the same circuit. It also includes a colloidal silver generator, complete with pure silver wires. It's $155, including shipping, from Butterfly Products, Box 1729, Hillsboro NH 03224.

The bioelectrifier is supposed to clean any virus, microbe, yeast, fungus, or parasite from the blood. It does seem to be

working miracles — I had a nice letter yesterday from a woman who said that her doctor couldn't believe her latest x-rays. Her cancer was completely gone!

My greatest pleasure every day is in reading letters from people I've helped. Like the one from Carl Maggio, who wrote, "I feel like a different person, with all my aches and pains gone. I've lost 10 pounds, the last 10 pounds that I couldn't get off no matter what I ate or did exercisewise. I look younger than I have in years and feel better than I ever have. My digestion system is no longer giving me problems and I now weigh what I did in high school."

You will want to be able to make colloidal silver, which is a powerful anti-bacterial agent.

You might want to look into gas masks, too. Call (618) 655-0383, (800) MSA-222, or (800) 866-4876 for further information. They may have protective suits, too. For Tyvek coveralls with a hood, try (800) 362-1000 and (800) 543-8955.

Or you can wait and see what develops. If the Dayton HamVention is still around in 2005, I'll be there to celebrate the 50th anniversary of my first HamVention and you can poke fun at me for being a worrywart.

Home Power

The TV magazine shows have finally started pushing Y2K nervousness. It started in May with a *60 Minutes* interview with the woman in charge of Y2K for Washington DC. She admitted that there is a good possibility that the power grid could go down for a few days to even a few weeks. I think reality is finally beginning to soak in.

So what does this mean to you, oh great communicator? It means that if the power goes down, taking with it the telephones, and probably the satellites too, about all communities are going to have left are some CBers, with very limited range, and you, brother ham. That's assuming that you've bothered to upgrade so you can use the HF bands and talk to more than someone over a probably now dead repeater. How many repeaters have emergency power systems so they can keep going indefinitely when the power companies are on an extended vacation?

Art Bell W6OBB has put in a whopping solar power system, plus a windmill. I don't think there's anyone in the country who is more knowledgeable about the potential Y2K problems than Art. He's interviewed all of the top experts on his show. In depth. And Art is sincerely worried by what he's learned.

Okay, so what should you get to keep you on the air when the lights go out? A car rig is fine. Or, at least it will be for a day or two. But with the power off, gas pumps won't work, so you'll soon run out of gas. You're going to want to think in terms of solar and wind, just as Art has. And that means that you're going to spend $22.50 and subscribe to *Home Power* magazine, Box 520, Ashland OR 97520, (800) 707-6585. It's edited by Richard Perez N7BCR. His whole crew are hams, and their offices are solar-powered. His magazine is packed with great articles on home power systems. Plus ads you'll want to see.

Yes, Another Y2K Update

Well, you've been easing off on your preps, so you need a jolt of reality.

For instance, Senator Bob Bennett, who not long ago opined that Y2K might be just a bump in the road, now says, "How high that bump will be, how radical it will be, I don't know." He further said, "there will be an economic consequence to Y2K," and told Americans to "take care of your own life" when it comes to personal preparations.

Bennett indicated that the government will be increasingly encouraging people to be prepared for local failures, which could easily add up to "an interesting problem on your hands." He indicated that making serious precautions would not be an overreaction.

So, are you set with a dependable water source, enough food to carry you and your family for several weeks, some way to keep warm, protect your home, and so on?

Has your local club been organizing an emergency communications system?

Music Heals

Yeah, I was ahead of my time again. Big surprise. Back in 1951 I became the General Secretary of the Music Research Foundation, with offices on Madison Avenue in New York. Well, a good RTTY ham friend of mine, Graham Claytor, was the vice president of Pacific Gas and Electric, so we got to be friends. He knew of my background in music and psychotherapy, so he introduced me to the wife of the president of the company and the next thing I knew I was running the Foundation.

I enjoyed the work, which meant organizing conferences of the leading psychotherapists (psychologists, psychiatrists, psychoanalysts) for monthly meetings. I also got busy and wrote a book, *Music For Your Moods*, which the Foundation published, complete with the usual cocktail party publication party.

Okay, now that the bragging is done, let's come up to date. It turns out that music can have a profound effect in helping people recover from stroke, provide improvement for people with Alzheimer's and Parkinson's, and so on. Mozart before an IQ test, according to

researchers at the University of California, Irvine, boosts scores an average of 9 points.

Scottish researchers found that a daily dose of Mozart or Mendelssohn significantly helped stroke victims. In Cleveland, it was shown that it could boost the immune function of children. Preemies exposed to lullabies in the hospital went home earlier. Well, you get the picture.

Okay, now let's talk about you. You can substantially improve your body by listening to some music every day. It'll help reduce your stress, and that, in turn, will pep up your immune system, as well as make you easier to get along with. Stress is a killer, as you know. So what are you doing to reduce your stress level?

One reason a few minutes of meditation every day helps so many people is that this also helps reduce stress.

Classical music, if it's really good, which unfortunately most isn't, can work wonders. Of course, if you have never been exposed to classical music, it may be a little late to develop a love of it. Even Mozart turned out some stinkers, so if classical music is new to you I have a $5 guide which will help you find the really outstanding music. It explains which are the best of Mozart's symphonies, Beethoven's, and so on. It'll also help you find some of the more hidden gems of classical music such as the music of Gottschalk, Nazareth, and Joplin.

But no matter what kind of music you enjoy, allow some time every day to turn it on.

If you start getting interested in building a CD library, other than classical, you'll benefit from the Adventures In Music CD samplers I have available. Each one has the top-rated tracks from about 15 different independently produced CDs, and they cover most kinds of music. At $3 a pop, you will never find a source for better music at such a price. Send an SASE for my Adventures In Music catalog. I've got 83 different samplers in stock — while they last. An SASE will bring my catalog.

$100 Billion

While you've been sleeping, your Congress, ever generous with your money, has budgeted $100 billion for the space station. NASA is busy working on the project, with one US-built section already in orbit, connected to a Russian section. What they don't have is any good reason for this project, other than scientists' and the rocket industry's welfare. And that $100 bil is just today's estimates. Insiders are predicting it'll probably cost at least double to triple that. And what project hasn't?

Hmm, let's see, if we divide $100 bil by 200 million taxpayer families, that's $500 out of your pocket for this extravaganza. Well, heck, that's only about a week's work, so who cares, right?

There have been some little problems with the hardware they already have lofted. It seems that the navigation controls for the station are in the Russian part, and when there was a danger of a collision with some other space debris they found that the control system didn't work. Repair crews have had to be sent up to try to solve some of these problems, and to fix parts of the Russian unit that were found to be defective but which weren't discovered before launching their part of the station.

Once they've got it up there, other than a few experiments which could easily be done in a much smaller and less expensive facility, there's been little commercial interest in the project.

The Space Station

Like the super collider, which thankfully Congress finally scuttled, I view NASA's space station project as little more than another scientist welfare program. NASA has no clear rationale for the pro- ject. They spent $20 billion before one piece of hardware had been lofted into space for it. So what do we have? A bigger, better *Mir!* And what benefits has *Mir* provided? Some ham radio contacts and lots of news coverage of its endless woes.

The original space station idea was to have a platform in space from which to keep track of what was going on in hostile countries and to be able to dump nukes on them when they got too uppity. But all that's been made irrelevant by our spy satellites and missile delivery systems.

Well, how about a scientific laboratory in space? We've been doing scientific work in our temporary space stations known as orbiters. If anything of value has come of that NASA has managed to keep it under wraps — something that NASA is not famous for doing, unless it's bad news.

So what is the rationale for spending billions on NASA these days? It's an expensive agency with thousands of employees and no clear mission. It's mainly been ferrying satellites into orbit for the military, a bunch of black projects, and communications companies. There it's in competition with the French, Chinese, and Russians, who are providing discount rides for the same customers.

Oh, NASA is still mumbling about sending astronauts back to the Moon or even to Mars, but until they can convince me (and almost anyone else who's seriously looked into the matter) that they didn't have to fake the Moon landings 30 years ago, I think we could save billions by re-issuing the movie "Capricorn One" and making do.

The array of satellites in near-Earth orbits have revolutionized communications for us, so we've benefited from that program and the space shuttle. But, given the lack of any good reason for lofting the space station, would you voluntarily donate $500 out of your pocket for the project? Secondarily, do you have any objection to Congress grabbing the $500 out of your pocket via the IRS's long arm, whether you like it or not, and putting you in prison if you refuse to pay? Stop mumbling about well, gee, somebody ought to do something about this, but you're too busy.

Still Smoking?

A medical school research study of 9,223 non-demented seniors in Rotterdam found that smokers showed a much greater decline in memory and other cognitive faculties than did non-smokers. So, in addition to smokers losing their sex drive in their 40s, and heading toward emphysema, cancer, or a heart attack in their 60s, they're also going to lose their memories and ability to think. So how much is all that going to cost businesses in government-mandated health insurance?

My dad smoked Camels and there was nothing I could say to stop him. When he was in his 60s he started passing out. *That* convinced him. But his last 20 years were a nightmare of emphysema, heart trouble, fainting, and so on. For most of those years, he had to have an oxygen bottle with him 24 hours a day, but even so, he could only walk a few feet before having to rest. So yes, I am a real nuisance when I see some stupid kid smoking. I don't believe a kid with any intelligence these days would get started with a nicotine addiction.

My grandfather was a brilliant inventor. It was his inventions that founded Citgo, whose gas stations you see everywhere. But he smoked, so his lungs had no stamina and he died in his 50s of pneumonia.

When I go to the reunions of my old submarine buddies I now see that very few of the smokers are still alive. Indeed, quite a few of them started dying around 20 years ago, mostly from smoking-related illnesses.

AARP

Now that most hams are senior citizens, they might want to take a good look at *Trust Betrayed* by Dale VanAtta. He exposes the AARP excesses. Like the $16,000,000 a year they pay in rent for their Taj Mahal HQ building. The head guy makes $287,000 a year, plus $49,000

for expenses. They have over 1700 employees, of which 6% are over 60. And so on. Read the book and you'll have a lot to talk about the next time you contact a retiree, which seems like the case most of the time these days.

Mooning

A lovely ad for a three-volume set of books commemorating the 30th anniversary of the Apollo flights came from Time-Life books. $65 for the three volumes normally, but special, for me, $50. Wow! It's a lovely mailing piece, with an 8-page full-color insert.

My goodness, we were able to make nine lunar (and six landing) trips 30 years ago, and here we are 30 years later, with far, far more advanced space and computer technologies, and still we've never been back to the Moon! We haven't even gone on to Mars, except in the movie "Capricorn One."

For those readers who are convinced that Uncle Wayne is crazy for believing that NASA's Moon trips were all faked, and who have supported that conviction by not being interested in doing any of the research I've done which forced that conclusion on me, this set of Time-Life books will help perpetuate the myth.

It was René's $25 *NASA Mooned America* which forced me to accept that I'd been hoodwinked by the second biggest government lie in history. Have you read the book yet? Or are you so totally brainwashed that you would prefer not to be confronted by this exposé? As with *Dark Moon*, I think I'm the only source for these books, but if I suddenly have a heart attack or a stroke, I hope you'll suspect that I got into trouble for messing around with things I shouldn't. I notice that the whistle-blowers Art Bell has been giving air time to are mysteriously dropping all over the place. The CIA knows how to induce these things.

Between these two excellent books, plus the further data from Bill Kaysing's *We Never Went to the Moon*, and a bunch of supporting letters from readers who worked for NASA or their suppliers, the evidence that the Apollo missions were faked is conclusive.

More Mooning

Dig out your July 19th copy of *Time* and turn to page 68, where they have a two-page photo spread supposedly taken on the Moon. Yes, I know you don't want to believe the Moon landings could possibly have been faked, and I don't blame you. But get out that issue of *Time*, take a look at the Moon photograph, and answer these questions for me.

(1) With the Sun as the only source of light, how come the shadows cast by the chap in the foreground is going one way and the shadows cast by the Rover and nearby rocks are about 120° in a completely different direction? Two Suns?

(2) Professor Fred Whipple of the Smithsonian Astrophysical Laboratory in Cambridge, Mass., claims that dust particles will become tightly packed, making a concretelike surface, unless there are some gasses (like air) to filter in between and separate them. This was confirmed by David Bowen at the North American Aviation Company, who put fine dust in a container, evacuated the air, and then dropped a steel ball into it. The crust was solid and the ball didn't even dent it. Thus, the astronauts, who weighed about 65 pounds with their suits and backpacks, should not have been able to make any boot marks or get any dust on their suits. Nor should there be any Rover tracks. There's not supposed to be any atmosphere at all on the Moon. If they'd found one there, that would have been front page news. That would also have meant that the Moon would have to have a much stronger gravity, or else the atmosphere would have long ago dissipated into space.

(3) One thing astronauts in low Earth orbit have always commented on is how incredibly bright the stars are once they were beyond our atmosphere. There is not one star showing in the photo. Or in *any* other Moon photos.

(4) How come the ground nearby is a much darker gray than the hills in the background? Shouldn't everything be the same color? And note that there are rocks in the foreground, but none in the background. The background looks exactly like a scenery backdrop. It ain't real. I used to be the Chief Cameraman at WPIX in New York and then a TV director in Dallas and Cleveland, so I know a set when I see one.

(5) Now take a look at the Rover. How did NASA get that big, heavy thing up there? The LEM is made with thin foam plastic walls, covered with inside and outside layers of 0.001-inch aluminum foil. No matter how they attached Rover to the LEM it would throw it way off balance, making it spin when the landing rocket was fired. And then how did the two astronauts manage to get it down from where it was suspended? NASA has refused to answer questions on how or where the Rover was attached to the LEM. Or any other questions about the Apollo trips.

That Belt

Tesla predicted that there was a high energy belt around the Earth that was shielding us from most of the Sun's high energy radiation. He was, of course,

ridiculed by our leading scientists for proposing such a preposterous theory.

In the late 1950s our government spent millions sending up high altitude balloons, which then launched rockets into space with Geiger counters. They confirmed the Tesla predictions, now called the Van Allen Belts.

The first experiments puzzled scientists because the Geiger counters reported higher and higher radiation, and then suddenly it dropped to zero. They then sent up a lead-shielded counter, which confirmed that the radiation was enormously higher than predicted.

Indeed, the SST carries a radiation counter, and when the count reaches 10 millirems the SST has to go to a lower (and less efficient) altitude to protect the passengers and crew. Experts consider 25 rem as being the maximum possible lifetime radiation dose, so the 10 to 100 rems per hour in the Van Allen Belt, which takes a rocket ship about an hour to navigate, would likely kill any unprotected astronauts.

Then, in addition to the high level of radiation in the Van Allen Belt, there are the solar flares, which average about 15 a day. We're talking about 369 rem, enough to kill almost anything. In *Prospects for Interstellar Travel*, John Mauldin claimed that at least six feet of lead shielding would be needed to protect anything living.

The Moon has no radiation belt protecting it, so the full force of the solar flares hit its surface. Now, remember that the LEM was made of foam plastic sheets covered by two layers of aluminum foil.

According to Van Allen, the exposure for any astronaut going to the Moon and back would have to have been between 60 and 240 rem. None could have survived.

RTTY '99

While I was answering my E-mail this morning, two hams broke in to rag chew. Déjà vu. It was just like RTTY in 1949, when I got involved and built my interface unit. It was the fun of being able to type back and forth with the group on 147.96 MHz in the greater New York area that got me started in ham publishing. It was so much fun that I just *had* to share my fun with as many other hams as I could.

I tried to get John Williams W2BFD, the father of ham teletype to do a newsletter, but he was "too busy."

We had about 30 of us on the channel, using a repeater John and I set up on top of the Municipal Building in downtown Manhattan. I've written about me installing the antenna in the middle of the night on the sloping copper roof in the middle of a snow storm. Well, it was at the beginning of a VHF contest and I wanted to get the station on the air and make some contest contacts.

Our Teletype machine controllers let us turn on the machines of anyone in the group and leave messages. Their transmitters would then give a beep-beep signal to let us know that the message had been received. Like Fax today. I used to leave my machine turned on when I'd go downtown for a few hours and I'd come home to a printout of yards and yards of messages exchanged among the gang.

Like today with our computers, where we can send attachments, I had a bunch of documents saved on punched tape that I could put on at any time to tell a story or explain something. And all at 60 wpm.

It was when I went to work for WXEL-TV in Cleveland in 1951 as the director of their live programming that I started *Amateur Radio Frontiers*. Well, they had a mimeo machine sitting there that I could use at night. That magazine grew to 32 pages over the next four years.

Anyway, the fun of the old RTTY days is back via the Internet. And no QSLs required!

Little Boy

That's the code name for the bomb we dropped on Hiroshima. For the first time, as far as I know, the inside story of the development of the atomic bomb and the decision to drop it on Hiroshima has been told. The book, *The Angry Genie*, by Morgan and Peterson, explains in detail the development of the bomb and the political maneuvering that resulted in it being used on Hiroshima and then Nagasaki.

President Truman was in favor of the bomb being used in a remote Japanese island as a demonstration of its power as a way to get the Japanese to surrender faster. The Japanese were already discussing surrender terms, but Army General Leslie Groves wanted to find out what the effect of the bomb would be on a city. He also wanted to find out what the difference would be between the destruction of cities between the U-235 atomic bomb (Little Boy) and the plutonium U-239 (Fat Boy) bombs, so he wanted to test the bombs on two Japanese cities.

Secretary of War Stimson and Secretary of State Byrnes also were in favor of using the bomb on a city as a "diplomatic master card" in the relations with Stalin.

Meanwhile, 67 scientists involved in making the bomb signed a petition

Continued on page 58

The History of Ham Radio

Parts 1 and 2: From the birth of the wireless age to 1920.

By Eric G. Schalkhausser W9CI, SK

When trying to get just a glimpse of wireless history in a nutshell, it is traditional to lay most emphasis on the years from 1910 and on. This period coincided with radio rules and regulations, the three R's, being formulated by the United States government. We then project the general accumulation as far as 1927–1928, after which time some degree of order was again established in the radio industry, overall.

In telling our story, it is impossible to refrain from making pertinent insertions of interest. There were many occurrences during those early years that stand out vividly in memory and need telling. Those beginning years were mostly of pioneering and exploring, bringing forth many discoveries and inventions in rapid order, in very short periods of time.

1909

To begin with, let me set the year 1909 as a reference. Why 1909? We will become aware of the reason as we review the history in relating the *magic that is wireless.*

Adapted from *73 Amateur Radio,* March and April 1977, where portions of this were originally reprinted from *QCC News*, a publication of the Chicago Area Chapter of the QCWA.

And it sure was magic to everyone in those days, believe me! Let me take a short glimpse into the past history of wireless. There were no laws on the books. There were no rules or regulations pertaining to wireless. The general public was not even aware that radio waves existed. They had no inkling of what was meant by communicating without wires. Practically nothing was known about electricity. All this was a mystery.

1888

In 1888, just 89 years ago [in 1977], a German scientist made a discovery when he sensed that there was something present in the vicinity of an electrical spark in a Leyden jar discharge. This elementary discovery made by Heinrich Hertz set the stage for many scientific investigations. They were carried on in university laboratories, stimulating research in the field of electromagnetic waves.

1892

About this time, along came Marconi from Italy. He was born in the year 1874. At the age of 18, while a freshman at the University of Bologna, Marconi discovered that an electric discharge from a condenser could be detected. This made possible the transmission and reception of signals over some distance. Playing around and experimenting for four years, he finally went to England, where he demonstrated his finding and equipment.

1896

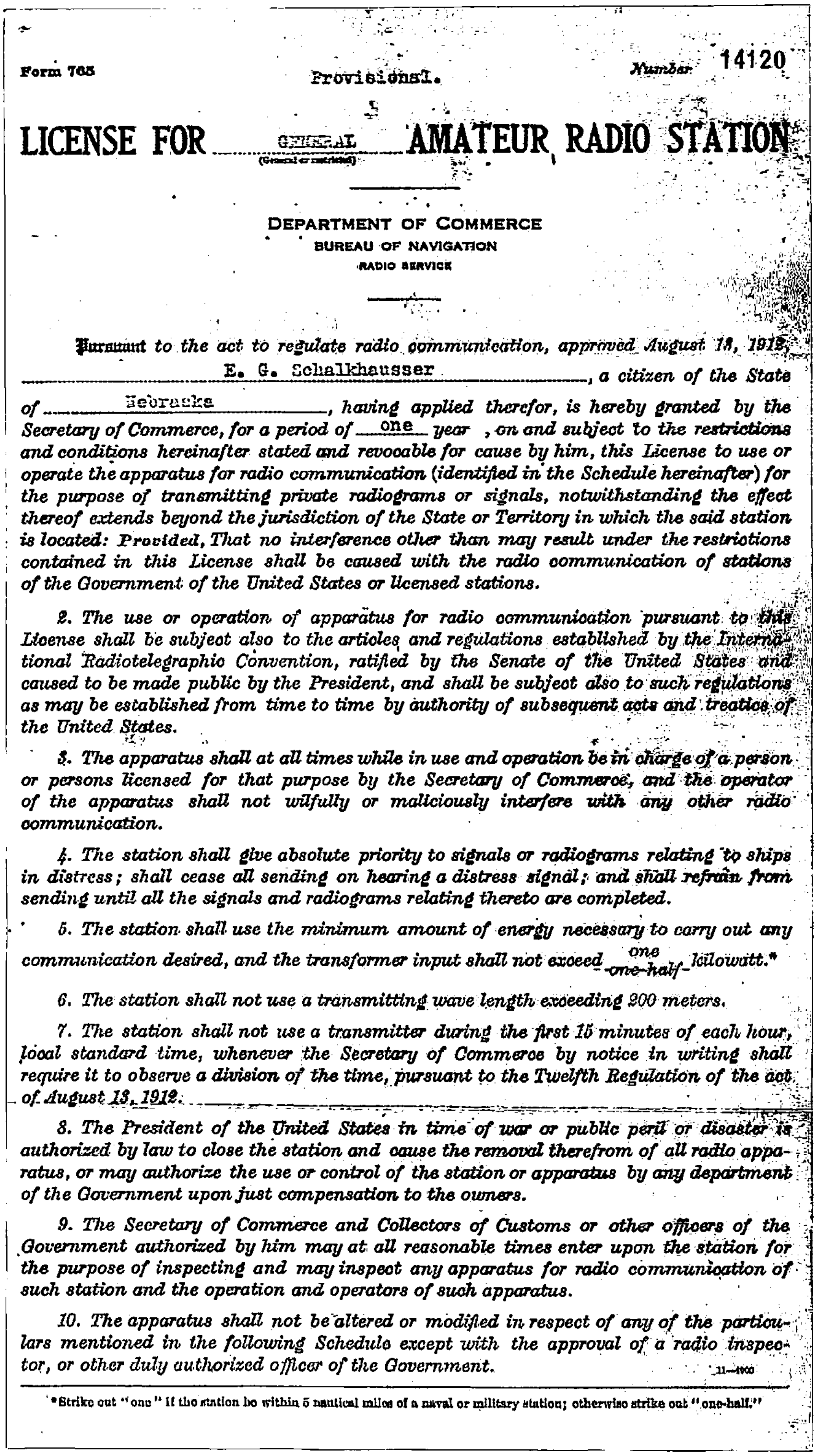
In 1896, Marconi obtained a British patent for *wireless telegraph apparatus using electricity.* How utterly novel and primitive that description sounds today. And that was only eighty-one years ago [in 1977]! (At that time I was 3 years old, but do not recall the incident!)

1897

Within a year, commercial interests became aware of the possibilities in the application and use of Marconi's invention and organized the Wireless Telegraph and Signal Company, Ltd., in England.

1899

In 1899, Marconi and his assistants succeeded in sending signals across the English Channel with their crude equipment. The main bottleneck was their iron filing coherer for detection of signals. The use of galena, silicon, or carborundum was not yet known for



Form 765

Provisional. Number 14120

LICENSE FOR GENERAL AMATEUR RADIO STATION
(General or restricted)

DEPARTMENT OF COMMERCE
BUREAU OF NAVIGATION
RADIO SERVICE

Pursuant to the act to regulate radio communication, approved August 13, 1912, E. G. Schalkhausser, *a citizen of the State of* Nebraska, *having applied therefor, is hereby granted by the Secretary of Commerce, for a period of* one *year, on and subject to the restrictions and conditions hereinafter stated and revocable for cause by him, this License to use or operate the apparatus for radio communication (identified in the Schedule hereinafter) for the purpose of transmitting private radiograms or signals, notwithstanding the effect thereof extends beyond the jurisdiction of the State or Territory in which the said station is located: Provided, That no interference other than may result under the restrictions contained in this License shall be caused with the radio communication of stations of the Government of the United States or licensed stations.*

2. The use or operation of apparatus for radio communication pursuant to this License shall be subject also to the articles and regulations established by the International Radiotelegraphic Convention, ratified by the Senate of the United States and caused to be made public by the President, and shall be subject also to such regulations as may be established from time to time by authority of subsequent acts and treaties of the United States.

3. The apparatus shall at all times while in use and operation be in charge of a person or persons licensed for that purpose by the Secretary of Commerce, and the operator of the apparatus shall not wilfully or maliciously interfere with any other radio communication.

4. The station shall give absolute priority to signals or radiograms relating to ships in distress; shall cease all sending on hearing a distress signal; and shall refrain from sending until all the signals and radiograms relating thereto are completed.

5. The station shall use the minimum amount of energy necessary to carry out any communication desired, and the transformer input shall not exceed one ~~one-half~~ *kilowatt.**

6. The station shall not use a transmitting wave length exceeding 200 meters.

7. The station shall not use a transmitter during the first 15 minutes of each hour, local standard time, whenever the Secretary of Commerce by notice in writing shall require it to observe a division of the time, pursuant to the Twelfth Regulation of the act of August 13, 1912.

8. The President of the United States in time of war or public peril or disaster is authorized by law to close the station and cause the removal therefrom of all radio apparatus, or may authorize the use or control of the station or apparatus by any department of the Government upon just compensation to the owners.

9. The Secretary of Commerce and Collectors of Customs or other officers of the Government authorized by him may at all reasonable times enter upon the station for the purpose of inspecting and may inspect any apparatus for radio communication of such station and the operation and operators of such apparatus.

10. The apparatus shall not be altered or modified in respect of any of the particulars mentioned in the following Schedule except with the approval of a radio inspector, or other duly authorized officer of the Government.

11—1900

*Strike out "one" if the station be within 5 nautical miles of a naval or military station; otherwise strike out "one-half."

Photo A. 1912 provisional license.

detecting wireless signals. In this same year, the Marconi Wireless Company of America was established.

1900

At the turn of the century, the English co. changed its name to Marconi Wireless Telegraph Company, Ltd., to be more in keeping with current developments.

1901

In 1901, Marconi and two of his engineers came across the Atlantic to set up their wireless equipment in Halifax, Newfoundland. They succeeded in receiving messages across the waters from a station transmitting out of Poldhu, England. All this on very long wavelengths, since the shorter ones were still undiscovered. By this time, many ships at sea were installing transmitting and receiving equipment and many shore and inland locations had established communication centers.

1902

By 1902, a great deal of interest was shown in the application of this relatively new phenomenon. Gradually, better detecting devices were invented and larger stations were erected in Europe, America, and other countries. One should call attention to the contributions made at this time by Sir J.J. Thompson, a British scientist, who had discovered the electron, enclosed in a vacuum tube. It was a sequel to Edison's invention of the light bulb.

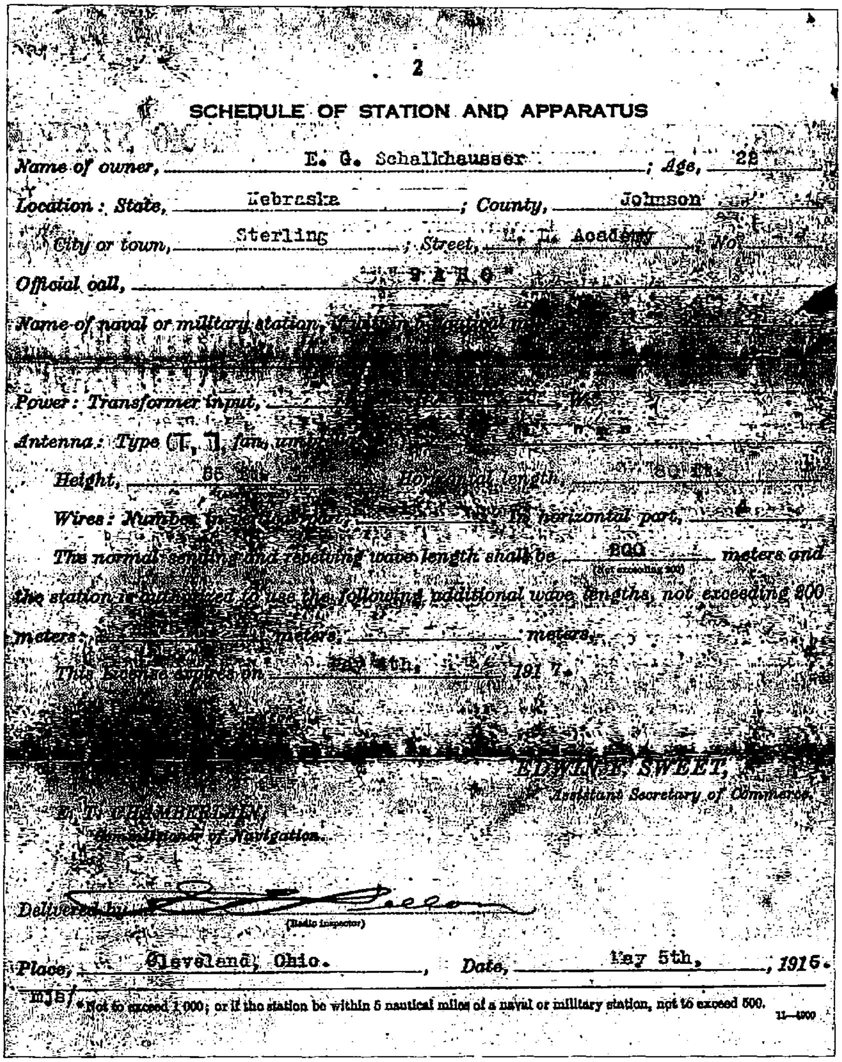
1904 and 1906

This led to the development of the use of vacuum tubes in detecting wireless signals, where J.A. Fleming in 1904 and Lee DeForest in 1906 made their contributions. While the sagas of the sea kept the newspapers busy and the public talking of the great wonders of wireless and its possibilities, what do you suppose was going on among the younger scientists across the country, especially in the eastern part of our United States? All of these intriguing possibilities of radio did not just belong to commercial companies — *by no means!*

Here we digress a bit and look into the back rooms and woodsheds around the country, taking note of the enthusiasm and the influence that wireless had produced among the young. We need to find out what was going on in these areas, since this part of early wireless history is vital in following the progress of the new discovery.

1909

This brings me to the year 1909, previously referred to. While the commercial


2

SCHEDULE OF STATION AND APPARATUS

Name of owner, E. G. Schallhausser ; Age, 28

Location: State, Nebraska ; County, Johnson

City or town, Sterling ; Street,

Official call,

Name of naval or military station,

Power: Transformer input,

Antenna: Type

Height, ; Horizontal length,

Wires: Number ; horizontal part,

The normal sending and receiving wave length shall be 800 meters and

the station is authorized to use the following additional wave lengths, not exceeding 800

meters; meters; meters.

This license expires on 191 7.

EDWIN F. SWEET,

Assistant Secretary of Commerce.

E. T. CHAMBERLAIN,

Commissioner of Navigation.

Delivered by

(Radio inspector)

Place, Cleveland, Ohio. , Date, May 5th, , 1916.

*Not to exceed 1,000; or if the station be within 5 nautical miles of a naval or military station, not to exceed 500.

Photo B. Schedule of Station and Apparatus.

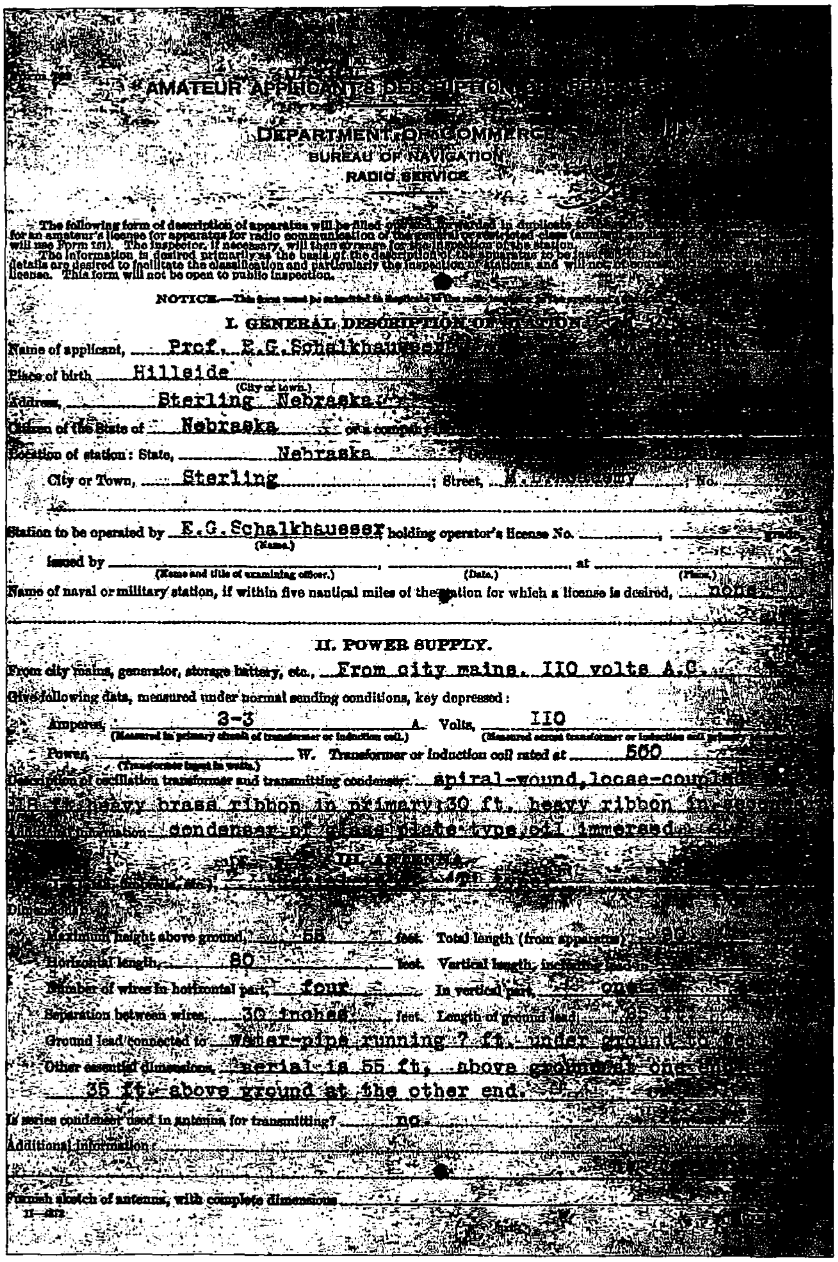
interests considered wireless in terms of their restricted domain, we find a group of "wireless kids" in New York, no more than ten in number, all in their teens, getting together and forming a Junior Wireless Club on January 2, 1909.

They were putting together metal plates, wires, and iron filings, making their own coherers, winding coils and other paraphernalia, and succeeding in sending dots and dashes according to the Morse code, between their homes, from block to block, and even across miles. They were listening in to what was going on, hearing the messages floating around between ships and shore stations. This was real fascination!

1910

Naturally there were bound to be conflicts developing, especially between the commercial companies and the "interlopers." Interference occurred and became objectionable for "the big boys." So in the following year, 1910, the existing problems were brought to the halls of Congress, to find ways and means to regulate wireless communication and define domains. True, the ether was free space and belonged to everybody, but the commercials and their interests sought to have vested right in their use of this "free" space. Thus, the conflict ...

The conflict was brought to a head in the introduction of two bills, one in the House and one in the Senate. House Bill #23495 and Senate Bill #7243 were introduced. The senator strongly in favor of these bills was none other than Chancy Depew of New York, which was the bailiwick where the interlopers were operating. The contents of the bills were strongly against any use of the airways by anyone except the commercials. The teenagers with their homemade equipment and their determination, organization, and above all, their spirit, had other ideas. They wrote a letter to Chancy and told him so. Here we note something which will be of interest to all of you. The boys of the Junior Wireless Club had a meeting, selected their representatives, and asked to have a hearing in Washington. They composed another letter to Chancy Depew, were granted a hearing, and on April 28, 1910, were given the privilege of presenting their case. Believe it or not, these boys won their right to go on experimenting as they had done before. This Junior Wireless Club had performed like veterans in the halls of


AMATEUR APPLICANT'S DESCRIPTION

DEPARTMENT OF COMMERCE
BUREAU OF NAVIGATION
RADIO SERVICE

I. GENERAL DESCRIPTION

Name of applicant, Prof. E.G. Schalkhausser

Place of birth Hillside

Address, Sterling Nebraska

Citizen of the State of Nebraska

Location of station: State, Nebraska

City or Town, Sterling Street,

Station to be operated by E.G. Schalkhausser holding operator's license No.

Issued by (Name and title of examining officer.) (Date.) at (Place.)

Name of naval or military station, if within five nautical miles of the station for which a license is desired, none

II. POWER SUPPLY.

From city mains, generator, storage battery, etc., From city mains, 110 volts A.C.

Give following data, measured under normal sending conditions, key depressed:

Amperes, 3-3 A. Volts, 110

Power, W. Transformer or induction coil rated at 500

Description of oscillation transformer and transmitting condenser: spiral-wound, loose-coupled, heavy brass ribbon in primary; 30 ft. heavy ribbon

condenser of glass plate type, oil immersed

III. ANTENNA.

Maximum height above ground, 55 feet. Total length (from apparatus)

Horizontal length, 80 feet. Vertical length, including lead-in

Number of wires in horizontal part, four In vertical part,

Separation between wires, 30 inches feet. Length of ground lead

Ground lead connected to water-pipe running 7 ft. under ground

Other essential dimensions, aerial is 55 ft. above ground at one end, 35 ft. above ground at the other end.

Is series condenser used in antenna for transmitting? no

Additional information

Furnish sketch of antenna, with complete dimensions

Photo C. Amateur Applicant's Description of Apparatus.

congress, and to them and many others went the freedom of the ether for many years to come.

1911

So in 1911, the enthusiasm on the part of radio amateurs grew tremendously. In the same year, the Junior Wireless Club changed its name to the Radio Club of America, which it remains to this day. The members became notables in wireless. The club was held in very high esteem, especially after their confrontation with Congress and their display of courage and dedication for a cause dear to their hearts and right in principle.

By 1911, every wireless company and operator on ship and shore knew that regulations were a necessity to hold down interference in radio communication. An act, dated June 24, 1910, authorized by our Department of Commerce, Bureau of Navigation, became what at that time was considered the law of the land regarding radio transmission and reception. This act consisted of four sections, all very general, and was labeled An Act to Require Apparatus and Operators for Radio Communication on Certain Ocean Steamers.

1912

On July 23, 1912 (two years later), and then only pertaining to section one of the four sections, the act was amended, spelling out some specific details concerning operators and ships at sea. From then on, all transmitting stations would have to apply for a license to operate. The law was not too specific. It had loopholes, and many inland stations, especially amateur radio enthusiasts and experimenters, went about hooking up induction coils and going on the air with call letters assigned by themselves. For instance a "one inch" spark coil was considered to be limited to no further than eight or ten miles, and so did not fall within the law for crossing state borders! What a "primitive" concept of wireless in those days. The type of signal coming from these amateur-operated coils did not conform to any known bandwidth or frequency standard. A signal was "just a signal."

At this time, a number of wireless organizations blossomed. Notable among these were (1) The Institute of Radio Engineers, (2) The American Radio Relay League, and (3) The National Amateur Wireless Association. Up to this time there was very little literature or published information available. It did not take long for these to appear. Soon small companies issued store catalogs offering everything from loose couplers to crystals and crystal holders, headphones, and all sorts of gear to get the amateur started. Enthusiasm ran high. Wireless was a newfound discovery and appealed to the young as well as to the old. Wireless could be used to span great distances and for so many experiments. The fascination of distant communication without wires was gripping and overwhelming.

1914

Hiram Percy Maxim was one individual

who could come up with the right ideas at the right time, and the ARRL was his heritage. No sooner had this enthusiasm caught fire when World War I broke out in Europe in 1914.

1917

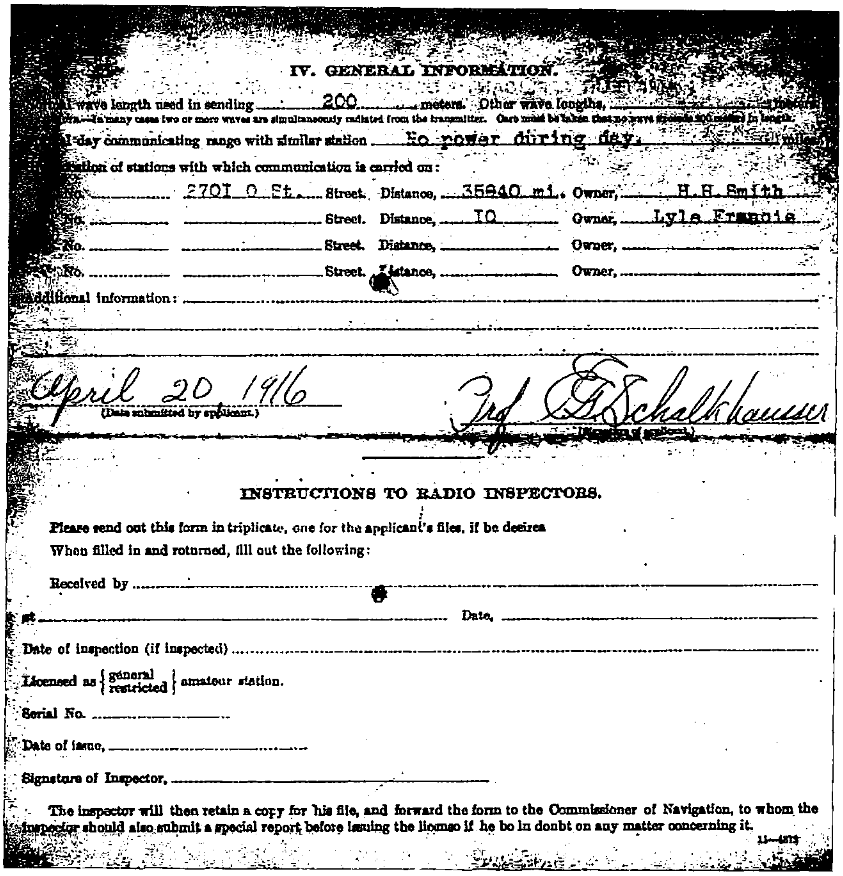
The conflict went on for several years and, sure enough, the United States became involved in 1917. All radio amateurs received notices to dismantle their equipment. Many joined the services in one capacity or other, many into the Signal Corps, where their training and experience as radio operators was greatly appreciated by the government.

During the hostilities of World War I, in which the United States was involved from April 1917, to November 1918, there were no amateur activities on the air. After the armistice was declared, amateurs still had to wait almost a year before permission was granted to dust off the old equipment, make repairs, catch up on the many changes to be made due to advancements in the art, and become active again.

It is interesting to follow the trend in activities among amateurs during the lull due to the war. *QST*, the publication of the Amateur Radio Relay League, continued to appear every month until September 1917. Then followed increased government restrictions, rather severe. The edict: "No radiation, no ground connections, no capacity or inductance to hook-up!" Amateurs were told, "You may read radio books, think radio thoughts, and learn the Morse code, until the call comes to join up." Many amateurs enlisted in the Signal Corps or the Navy, or found employment with the services.

1918

Although the armistice was signed on November 11, 1918, amateurs waited some months before radio publications were again available. The first postwar edition of *QST* appeared in July 1919, and other periodicals made their appearance, notably *Wireless Age* and *Radio Amateur News*. Restrictions on amateur transmission



IV. GENERAL INFORMATION.

...wave length used in sending 200 meters. Other wave lengths, ...

...In many cases two or more waves are simultaneously radiated from the transmitter. Care must be taken that no wave exceeds 200 meters in length.

...day communicating range with similar station No power during day. ... miles

...tion of stations with which communication is carried on:

No. 2701 O St. Street. Distance, 35840 mi. Owner, H. H. Smith

No. Street. Distance, 10 Owner, Lyle Francis

No. Street. Distance, Owner,

No. Street. Distance, Owner,

Additional information:

April 20 1916 (Date submitted by applicant.)

Prof. G. E. Schalkhauser (Signature of applicant.)

INSTRUCTIONS TO RADIO INSPECTORS.

Please send out this form in triplicate, one for the applicant's files, if he desires.

When filled in and returned, fill out the following:

Received by

at Date,

Date of inspection (if inspected)

Licensed as { general / restricted } amateur station.

Serial No.

Date of issue,

Signature of Inspector,

The inspector will then retain a copy for his file, and forward the form to the Commissioner of Navigation, to whom the inspector should also submit a special report before issuing the license if he be in doubt on any matter concerning it.

Photo D. An apparatus description, one of the required parts of getting an early ham ticket.

were removed by the government on October 1, 1919. Here it should be noted that an attempt was made through the introduction of a bill, known as HR 15159, requested by the Secretary of the Navy, to turn over all radio control to the Navy Department. This bill received very strong opposition from the amateur radio fraternity and was defeated.

What were the regulations which now governed the radio amateur? All licenses were canceled as of April 1, 1917. Rules and regulations had to be

Photo E. The station of 9AHO.

JUNIOR WIRELESS CLUB, LTD.

EACH MEMBER MUST HAVE MADE HIS OWN STATION.

W. E. D. Stokes, Jr., Its President—Headquarters at the Ansonia Contains Much Apparatus—Club to Go to Washington to Oppose Pending Bill.

It is somewhat dangerous to attempt to enter the clubroom and experimental station of the Junior Wireless Club, Ltd., without a guide, for the officer in charge dispenses with the necessity of lock and key by having the knob charged with electricity to give the unexpected—and unexpecting—visitor what he terms a "nice little shock."

But when proper guidance is secured from the club's young president, who maintains headquarters at his home, the Ansonia, many marvels and intricacies may be observed with some degree of security. W. E. D. Stokes, Jr., president, aged 11 years, points out the pitfalls.

"Look out. Don't step on that wire! Hold it!" says he. "It's charged!" And you look out and don't step.

The clubroom and receiving station is imposing, almost formidable despite its somewhat small extent. In addition to the wireless telephone instruments at one side of the windows, the sending station across the way and the aerials connecting with three conduits above many other things more or less electric add to the effect. A big electric turning lathe occupies one side of the room, numerous vari-colored models of aeroplanes—which the manufacturer asserts really go when wound up—hang from wire complexities overhead, zinc plates, worse than they look, are not to be ignored.

In fact it is not safe to put a hand to the most innocent looking object unless first reassured. A big box beneath the battery and motor table filled with perfectly staid appearing earth and plants which thrive on the rays of a makeshift sun specially arranged out of a 100 candle power electric bulb is not what it would seem. Those plants—roots, branch, leaf or blossom—are electrified and emit sparks when invited. On the side walls high and low, on the ceiling and suspended therefrom, bulbs of every conceivable variety, shape and power transform the little room into an Aladdin cave of brilliancy.

"I'm always looking around at bulbs," says the president, "and when I see a new kind I try it."

So there they are, long and slim, short, fat and round, but all shining and bringing out dazzlingly the blueprints of scientific aspect which adorn one side of the wall, posters of the Postal Telegraph and Cable Company variety, illuminated letter placards bearing such legends as "No Smoking," "S. W. Co."—Stokes Wireless Company—and last but not least printed lists of wireless signal stations and steamers with wireless equipment.

These steamers and signal stations are all intimately acquainted with the experimental station of the Junior Club, too much so at times it seems, when the Manhattan Beach station has to ask it to stop receiving for a time, for the Manhattan Beach station is less powerful and is retarded in receiving.

The young president puts the receiving headgear on your head.

"Listen," he says. "They're talking to Manhattan Beach."

"How can you read it?" you ask.

"Listen," he says. "[illegible] da-da-da-da, can't you hear it?" And he becomes a trifle impatient at your stupidity. He discourses on [illegible] detectors, sensitive points and other appropriate topics for your enlightenment but you are a poor subject.

Then the president tells how the Junior Wireless Club came to be, how it operates and what it intends.

About two years ago the Junior [illegible] Club, under the direction of Miss [illegible] Todd participated in the [illegible] exhibition held at Madison Square Garden. Three of these youthful members, [illegible] King, Fairfax Mann and Frederick [illegible], specialized on wireless telegraphy and frequented Miss Todd's [illegible] West Twenty-third street to experiment. [illegible] of them made his own wireless apparatus and through the newspapers they invited any other boy to come and show a [illegible] he had made himself.

W. E. D. Stokes, Jr., then aged [illegible] had rigged up a wireless outfit which [illegible] brought forth to display and which [illegible] King helped him set up. Such [illegible] as the "A B C of Wireless Telegraphy" and "Electricity of Every Day Life" [illegible] possible, the [illegible] assistance of [illegible] electricians were the [illegible] sources of information.

The father of W. E. D. [illegible] and invited them to [illegible]. There the Junior Wireless Club came into being with headquarters at the Ansonia, there being just enough offices to go around among the [illegible] members. W. E. D. Stokes, Jr., was made president, George [illegible] seventh street [illegible] Fairfax Mann, East Orange, N. J. [illegible] secretary, Frank King [illegible] Frederick Seymour, [illegible] treasurer. Miss [illegible] Todd was [illegible] honorary president, Prof. [illegible] of Brant Rock, Mass. [illegible] engineer, and [illegible] Broadway [illegible] counsel and patent attorney. [illegible] from the start the [illegible] letterheads presented a complete and dignified appearance and are as yet unchanged, although the club has extended its membership to thirteen.

At [illegible] M. the first Saturday of each month from October to May the [illegible] holds meetings at the [illegible] through the regular [illegible] acts on the business letters received and [illegible] the applications for membership [illegible] over schemes and, most of all, [illegible] the wireless. The necessary qualification for membership is that the applicant has himself made his own wireless apparatus; later he may have assistance and more elaborate mechanical contrivances, but the first rule is inviolable.

They first memorize the Morse code until they are able to think in dots and

W. E. D. STOKES, JR., AND HIS WIRELESS TELEGRAPH.

Photo F. This article appeared in a New York City newspaper early in 1910. The boy in the picture is the first president of the Junior Wireless Club, later renamed the Radio Club of America.

followed to go back on the air. Amateurs knew that the Department of Commerce still had complete jurisdiction with William Redfield, Secretary of Commerce, at the time. A publication issued by the Bureau of Navigation, Radio Service, dated August 1919, entitled "Radio Communication Law of the United States," indicated that no additional radio regulations had been added to those in effect as of the beginning of hostilities. In fact, no changes were made in the radio law during the interim between the introduction of the Act of June 24, 1910, and the ratification of the International Convention of Communications, finalized and signed by Woodrow Wilson, then president of the United States, on July 8, 1913.

1919

Applications for amateur radio operators and station licenses soon had the fraternity by the hundreds back into the swing. The spark coil, the rotary gap, and the old receivers had to be brought up from the basement or down from the attic, unpacked from storage bins, and put back into service. As soon as restrictions were removed, activity started with a vengeance. Radio shops blossomed everywhere. The old wireless bug put everybody to building loose couplers, variometers, honeycomb coils, simple detectors, and a host of new devices. Along came the newly developed *three-element* vacuum tube. Here was the beginning of the real revolution in reception and transmission of wireless signals. The VT-1 by Western Electric gave the amateurs their first chance to analyze its possibilities. There also were Morehead and Marconi tubes available, but they were very unstable as receiving as well as transmitting units. No two alike would respond equally in a circuit. We were all looking for the advent of larger and more powerful vacuum tubes, and anxious to replace the old spark transmitter. The amateurs knew that it was possible to do away with the noisy spark discharges with their interference problems due to wide bandwidths, and put a new kind of signal into the ether using vacuum tubes.

At ARRL headquarters in Hartford, Connecticut, where *QST* originated and where our newly appointed secretary and editor, K.B. Warner, took over right after the war, it was decided that the entire body of amateurs be organized into local and regional clubs and associations. The objectives were to foster and promote complete control of all ham activities such as relaying messages, to establish relay routes across the country, and to keep abreast of all governmental legislation pertaining to amateur radio activities.

K.B. Warner, the ARRL's new secretary, came from Cairo, Illinois. A very active amateur, he operated under the call 9JT in 1915, using a 1/2 kW fixed-gap transmitter.

All amateur radio stations were supposed to be operating on the 200 meter assigned wavelength. Adherence was not too strictly enforced. In fact, some stations were operating well above 200 meters. A few, with special permission, were well into the 375 meter range. So little was known about radio propagation that the erroneous assumption persisted that "the longer the wavelength, the greater the distance waves would travel." The August 1920, *QST* said, "For short wavelengths (below 200 meters) the signal strength is a function of the wavelength, and it may be said that the shorter the wavelength, the weaker the signal." *How strangely the ether waves behaved in those days!*

Everybody was still using interrupted CW, some straight, some quenched, with the only noticeable difference being in the pitch, the whine, and the characteristic interruption of the dots and dashes. Some found satisfaction in a 500 cycle note, if a 500 cycle generator could be found as the prime source of power. Interference created bedlam in many areas, especially before midnight, after which most of the spark coil operators quieted down and went to bed, giving the high-powered boys the ether. The maximum power transformer rating was one kW, usually a Thordarson or Clapp-Estham or equivalent rated at 25,000 volts secondary. The law was specific: "A transmitting wavelength not exceeding 200 meters and a transformer input not exceeding one kilowatt." The ammeter hot wire in the antenna usually was asked to register from 4 to 10 amperes into an L- or T-type antenna configuration. It had to be designed and built to a measured length, specifically not over 100 meters, to be within the law. There were plenty of parallel wires, usually at least four, to form a ground network of copper conductors (or buried copper washboilers) for a counterpoise.

The amateurs had a standby pal, "The Old Man," delivering pertinent information to all through articles in *QST*. He kept all in good humor and within the straightjacket of operating procedures. As an example of what could be expected from the OM, here is an excerpt directed to the editor from the June 1919, *QST* under the heading "Rotten Starting":

"I am sending you a specimen of a *Wouff Hong* which came to light out here when we started to get our junk out of cold storage. Keep it in the editorial sanctum where you can lay hands on it quickly in emergency. We will be allowed to transmit soon and then you will need it."

Who does not know the *Wouff Hong?*

What most of the amateurs surmised and expected was just ahead. We read in November, 1919:

"There will come a day when amateurs will not need to bother their heads about government or commercial stations, but THAT DAY HAS AS YET NOT ARRIVED. The radio millennium has still to come. We mean by this that with our present form of crude apparatus still in vogue, and when we are using quasi makeshifts, we cannot

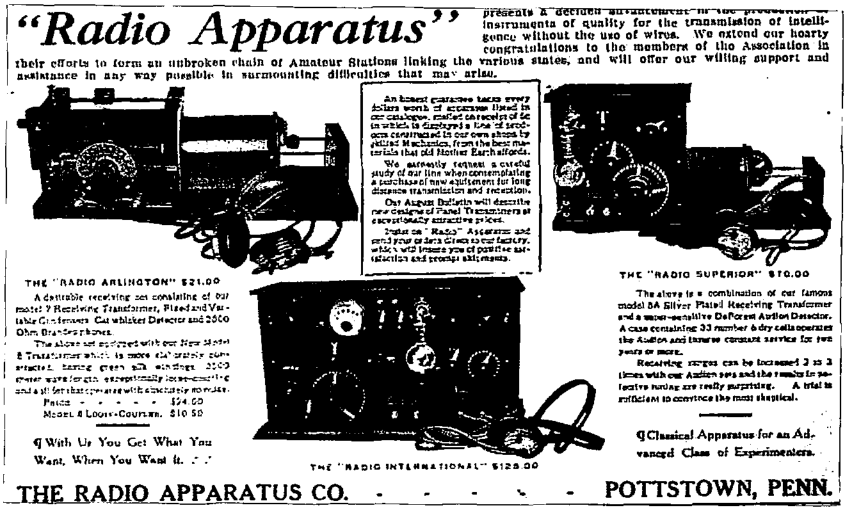


Photo G. *As soon as radio became popular as a hobby, equipment began appearing on the market. Note the flamboyant style of the copy, typical of the period. This ad appeared in 1915.*

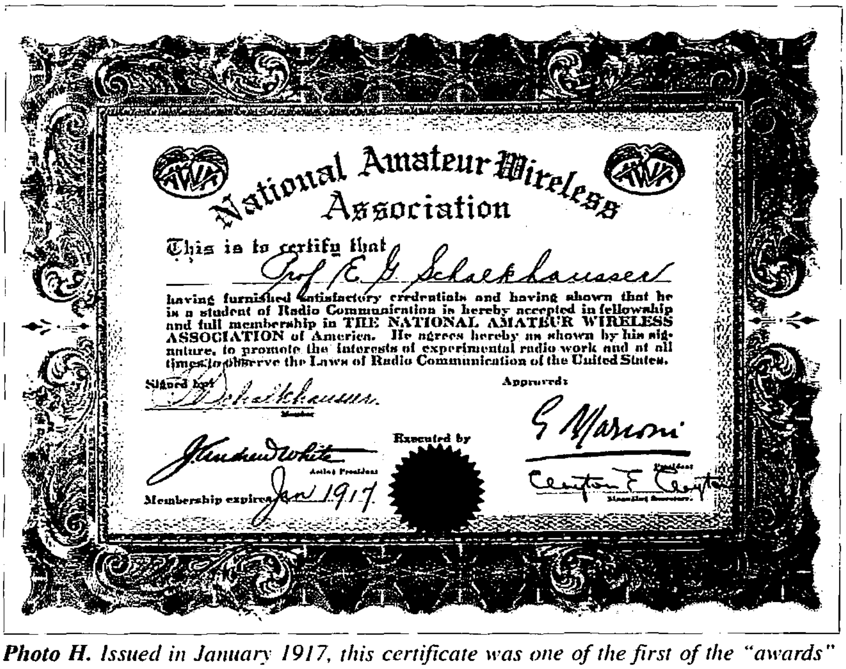


Photo H. *Issued in January 1917, this certificate was one of the first of the "awards" that hams have always displayed with pride on the walls of the shack.*

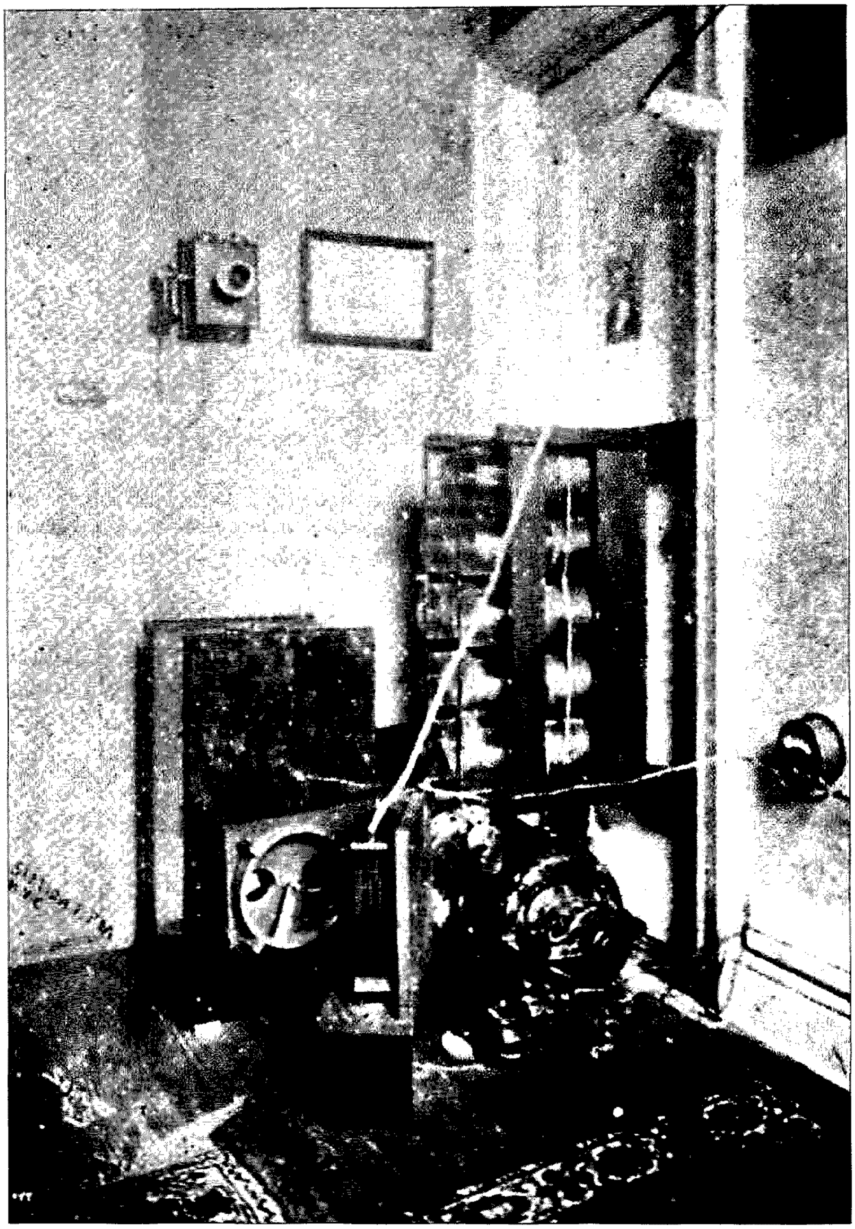


Photo I. The transmitter station "2PM", which produced the first transcontinental signals.

expect that we can tune our transmitters down to within the hundredth fraction of a meter. Usually the amateur wave is so broad that it can be picked up all over the scale. As long as we persist in sending out such waves, we must expect criticism from the big stations with which we interfere."

The junking of the radio spark gap was in the making. To actually let go was another thing. Some of the old-timers in 1920 complained that there was no romance in tube transmission—that it has no individuality or traditional associations like the old spark. There was always a certain stalwart and hearty attraction about the old non-sink rotary, noisy and inefficient as it was. So the *Old Guard* had to finally succumb also to *the little bulbs that had nothing in 'em.*

This is what Dr. Lee DeForest, the man responsible for the development of the three element tube, had to say at this time (November, 1919):

"The average radio amateur knows enough of the extreme selectivity which the pure undamped wave makes possible, to realize that the problems of interference would largely vanish with the spark gap. Let the amateur urge upon his Congressman or Senator that if the government wishes to further legislate against radio interference, then legislate out of business the damped-wave transmitter."

1920

So it became necessary that the amateurs gradually develop the use of the vacuum tube for the various modes of CW transmission, modulating via key and voice, and for better receiving possibilities. With better sensitivity and selectivity built into receivers, our efforts were now directed toward solving the QSS *Bugaboo!* What is QSS? The Q code gives no definition. So — take a look into the May 1920 issue of *QST*, page 25. Well, since you do not have a copy, this "new" abbreviation was added to the list, adopted by ARRL to fill a need. What does it stand for?

QSS?—Do my signals fade?

QSS—Your signals fade.

Although rarely used, this abbreviation, even in these days, makes sense.

Amateur radio was not out of the woods regarding clear sailing without periodic attempts on the part of the government to curb their activities. The Poindexter Bill, originating as document #165 through a letter from the Secretary of the Navy, was in the hopper. It stood facing the amateurs later on as Poindexter Bill S-4038, and did not bode good news for the amateur. The time loomed on the radio horizon in 1920 to be thinking about international regulatory legislation to bring radio communication the world over under better control. A meeting of the International Communications Convention in Berne, Switzerland, was on the agenda. The radio amateurs had to have prominent representation. Intensive efforts were made to protect the rights and privileges belonging to the amateur. Charles H. Steward, member of the ARRL Board, was appointed legal counselor to speak for the amateur in these matters. In order to cement more firmly the ties that bind, amateurs decided that in numbers and in get-togethers there is strength, and much could be accomplished via this

Photo J. "2PM" operating position located at 808 West End Avenue in New York City.

route. The thinking centered on having regional conventions, typical gatherings to meet each other personally, to set out program meetings, and to air mutual problems.

One of the early conventions took place in Chicago, sponsored by the Central Division Managers of ARRL. Held September 2 to 4 at the Edgewater Beach Hotel, there were about four hundred in attendance. There had been similar conventions held in Boston and Philadelphia, but this one in Chicago was to be of wider scope in quantity and quality to bring home to all amateurs what we were up against. The report issued from headquarters: "The convention out-conventioned anything yet pulled off in amateur radio."

Not to be outdone, and to top off the year 1920, the Midwest ARRL Division decided that St. Louis would be the next place for a meeting. The time? December 28 to 30, under the sponsorship of the St. Louis Radio Club. Everybody of note in amateur radio circles showed up, from ARRL president Hiram P. Maxim, *QST* editor K. B. Warner, the Chicago gang, Paul Godley, M.B. West, R.H.G. Mathews, and of course, "The Old Man" himself, who gave a stirring account of the "joyous" and "glorious" three days.

To be continued.

HT Porta-Power Project

continued from page 15

1/4-inch and interior dimensions of 10-1/2 inches in length by 5 inches wide, which works well for this application. The box was bought at Staples, a retail chain office supply store. The only modification made to the box was cutting its wall height down so as to permit the cigarette lighter receptacle on the Power Station to be accessed. Someone with a table saw can easily do this. If you do not know of anyone who has a table saw, a cabinet shop or wood hobbyist in your local area should do it for a modest fee.

Getting it all together

Now comes the task of putting the whole package together. Place the Power Station toward the left side of the box. This allows the AC wall charger input jack to be easily accessed without rearranging the setup. In order to keep the Power Station from sliding around inside the box, position a piece of Styrofoam approximately 1/2 to 3/4 inches thick beside the Power Station. A piece about 3 x 5 inches will work to hold the Power Station in place by creating a stop that fills in the remaining space along the bottom of the box. This remaining space beside the Power Station can be used to store the HT battery, power cable, or other various accessories.

At this point, clip the HT somewhere along the front of the box. Locating it on the left side of the box permits clear

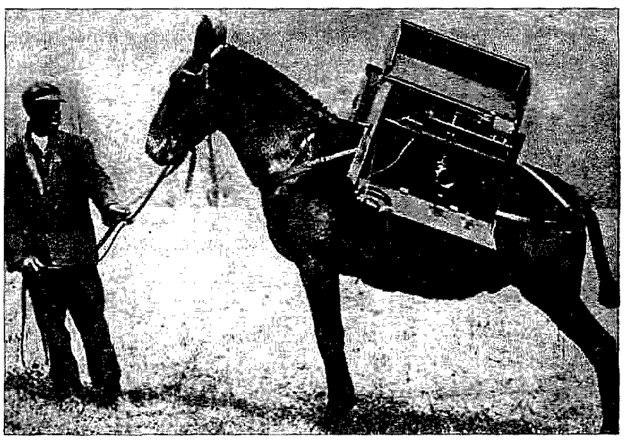


Photo K. "Mule Mobile" was used by the Signal Corps during World

Photo L. An early QSL card, sent in 1917.

access to the Power Station on-off switch and the 12 VDC output cigarette lighter receptacle. It also keeps the area of the battery voltmeter unobstructed. Run the HT's external power cord behind the HT and into the box. There should be enough space between the Power Station and the front wall of the box to put most of the cord. Then make connection to the 12 VDC output via the front panel cigarette lighter receptacle or the (+) and (-) terminals on the rear of the power unit. You could opt to use the 3, 6, or 9 VDC output jack if the desired operating voltage is to be less than 12 VDC.

Now the entire package must be bound together for easy transport. This is accomplished by using 1-inch-wide, 48-inches-long, non-stretch nylon belting material and plastic belt clips. The belt clips can be the type that do not require being sewn to the belting material. These items can be purchased at a fabric store such as Minnesota Fabrics. The belting is placed around the entire unit, going over the top of the Power Station handle, down the side, under the box, and up the other side. The fastening of the buckle clips can be located just off the right side of the power unit's handle. You may want to adjust the belt clips to whatever arrangement suits you. This method of holding the package all together works very well. The Power Station's handle actually is used as the handle for the whole package. The power unit has by far the majority of the weight, so it is best to employ its handle to do most of the work. The belting merely holds the box to the unit, which contributes a minimal amount of weight to the overall package.

If you use an external speaker microphone, it can be clipped to the front wall of the box or to an open spot on the belting material. For a finishing touch, consider adding self-adhesive rubber foot pads to the bottom corners of the box. They may be obtained at Radio Shack or a hobby store in your area.

The package makes a neat, highly portable, efficient, easy to configure, and long-lasting power source for extended operation. Also, it is very practical and inexpensive to put together! ■

Number 41 on your Feedback card

QRP

Low Power Operation

Michael Bryce WB8VGE
SunLight Energy Systems
955 Manchester Ave. SW
North Lawrence OH 44666
[prosolar@sssnet.com]

No one can predict the future. I know if I could. I would have never married my first wife! Because if I could foresee the future, I would have never sold my Heathkit HW-8 QRP transceiver. But I did, and ever since then I've been kicking myself in the butt for doing so. The Heathkit HW-8 has become a classic. You're not a QRP operator unless you've worked the world with an HW-8.

Now, having said all of that, I've been looking for an HW-8 on the used market for several years. The ones that I did find were either beat to hell and back or the owners wanted way too much money. At the Dayton Hamvention, I've seen HW-8s going for more than they were when they were new. Then I've found some that have been modified so much that they barely resemble the original HW-8. I have nothing bad to say about improving a rig's performance, but some of the guys added so many switches and buttons that they made their HW-8 a collection of unstable circuits.

The quest begins

All I really wanted was an unmodified HW-8. I could handle some of the simpler modifications such as a dial light and audio amplifier additions. I did not want multiband operation on the WARC bands. I wanted a clean, almost new, unit.

Of course, price was a matter of importance, too. Like everyone else in the world, I wanted the best bang for my buck. I set my budget at $150, provided that price included the operating and assembly manual. I did not need the matching power supply, but if one was available, why not?

Since time seems to be a short commodity in everyone's life, going to hamfests to get an HW-8 did not seem to be a good idea. However, at the hamfests that I did go to, I got a good idea of the going price vs. conditions of an HW-8. Even saw a few HW-7s along the way, too.

So instead of in-person shopping, I did a lot of looking on the Internet for a used HW-8. Some of the locations I visited were: [http://www.webcom.com/webpub/class.html]; [http://www.qth.com/classifieds.shtml]; and, of course, [www.ebay.com].

One of the worst things about buying anything used via the Internet is the lack of playing touchy-feely with the item. You've got to put your trust in the guy who's doing the selling. Most people rate the cosmetic condition of the equipment on a scale of one to ten, with ten being brand new. Now, what I consider a 9.5 may be a lot different from what you consider a 9.5. I've found that most guys selling via the auctions and ad listings are generally honest. If the radio has a defect or a missing knob, they will tell you so.

Now, having said all of that, I found my HW-8 at a hamfest! It was in very good shape and came with an original manual. It even had the entire foldout assembly instructions and schematic. After the usual haggling, the final price was $75.

How to pick a winner from the lemons

If you are buying from the Internet, then you're relying on the seller to report any bugs or cosmetic problems. It's also up to him to let you in on any electrical problem the rig may have, too.

At a hamfest, you have the ability to flip the switches and turn the knobs. Here's what to look for in a used HW-8: The first thing you want to do is run the tuning knob all the way into the stops. Don't force the knob past the stops. The idea is to see if the dial stops at the stops. If you can easily turn pass the stops, then the VFO capacitor may have its rotor plates torn up. Try this test on both ends of the VFO.

If you find the VFO is kaput, then either pass on this one or offer a very, very, very low price. If the VFO capacitor is kaput, then you've got one dead HW-8 on your hands. I know of no source for this VFO capacitor.

The audio selectivity knob is normally only two positions. If you have more than one, then someone at sometime modified the audio filter. If the selectivity knob rotates like a pot, that's not original either.

Check the front push-button switches used to change bands. They all should work. Test them by pushing each one in one at a time. For every one that you push in, the last one should pop out, just like the old-time car radios did. If you find one that does not stay in, the plastic pin is broken off inside the switch. Again, I don't know of a source for a replacement part.

Test the meter by quickly tilting the rig from one side to another. While this won't tell you if the meter has an open or shorted coil, it will let you know the needle is in its bearings.

Flip the rig over and check out the rear apron. The original antenna connector was an RCA-type jack. What do you see?

Continued on page 42

QRP

continued from page 41

Anything else is a modification to the circuit.

Do you see any switches, knobs, or jacks on the rear? Well if you do, then the HW-8 has been internally modified. How about the power plug? In the original configuration, there is a six-prong Molex connector.

Make a quick mental note about the screws holding the top cover on. Are they black Phillips-head screws or shiny slotted screws? Only the black Phillips-head screws are original. While I would not be upset knowing the original ones are not holding the cover on, it's nice to know this stuff if you're looking for a mint HW-8.

Take a look inside

If you can, pop the top and look inside the rig. I always carry a small screwdriver with me for just such tasks when trolling a hamfest. Be sure you ask permission from the owner before you start taking screws out. And be damn sure you take your time to put back the screws should you decide not to purchase the rig.

Inside, near the antenna connection, you should see a small relay. This is the antenna-switching relay. If you don't see it, the circuit has been changed. Next, look at the front corner on the opposite side of the push-buttons. Located here are the front-end trimmers used for the receiver. The adjustment screws should not be unscrewed to the point that they look like they will fall out! Also, check the position of the slug inside the metal VFO can located in the middle of the PC board. It too should be sitting about in the middle of its form.

If you follow these guidelines, you should be able to pick out an HW-8 in good shape. You have to keep in mind the HW-8 is going on 24+ years; it's going to be harder and harder to find one in mint condition. Also, that green Heathkit paint is very prone to scratches, so don't pass up on a good HW-8 because of a few case scratches on the top cover.

Some initial checks

Use a current-limiting power supply to fire up the HW-8. Batteries provide too much uncontrolled current for first time testing.

You'll also need a pair of high impedance headphones with a 1/4-inch plug. A second 1/4-inch plug for the key jack is required, too. A 50-ohm dummy load is required, as is a QRP RF wattmeter. You can use an SWR meter set to read forward power, too. If you don't have a wattmeter or SWR meter made for QRP use, you'll never see much deflection on the 100-watt-scale wattmeter in your shack.

Initial setup

Pay close attention to the power requirements for the HW-8. It requires 12–14 volts at 1 amp. The HW-8 will operate with a supply voltage as low as 10.5 volts. Watch your polarity! The HW-8 will go poof in a heartbeat if you connect it up backwards to the power source.

With a pair of high impedance headphones plugged into the HW-8, set the band switch to the 7 MHz position. Be sure the button is fully engaged. Turn the RF gain control fully clockwise (max gain) and snap on the power, leaving the volume in mid-range. You should hear a hissing noise from the rig. Run the VFO through its range. You should not hear any whistles or birdies.

If you can, monitor the supply current going to the rig. Be sure you have the 50-ohm load and RF meter connected to the HW-8 antenna output jack. Key down the transmitter. You should hear the antenna relay click, and a sidetone in the headphones. Now, the meter should show some deflection. Adjust the "load" control for maximum meter deflection. You should also see about two watts on your RF wattmeter and no more than 850 mA from the power supply.

The HW-8 will produce up to 2.5 watts of RF on 80 meters and as low as .9 watt on 15 meters. As the frequency increases, the less transmit power you'll see.

So far so good? If the HW-8 passes these checks, it's time to put an antenna on it. Since the HW-8 is a direct-conversion rig, I find it best to go to the high end of the band and work your way down. Tune in to the signal on the high side of zero beat. You tune in to a station calling CQ or into a QSO in progress. That way, when the HW-8 shifts its frequency during keydown, you're on the right sideband and the other station can hear you.

The Heathkit HW-8 is a classic QRP rig. They're great fun to use. It's by far the most popular QRP rig ever made. If you have the chance, pick one up.

Next time we meet, I'll have some troubleshooting tips for putting the HW-8 back into service.

Number 43 on your Feedback card

THE DIGITAL PORT

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PSK31 gets even better

The PSK31 really works, and has attracted a lot of attention. Most everyone I talk to is amazed at how good the copy can be from signals that often do not lift the needle on the S-meter. A truly low power winner. Occasionally, you will see copy on the screen and not hear the audio that is producing it!

I am watching my latest experiment as I write this column; the laptop is rigged for PSK31. I don't know how many laptops have a soundcard that is compatible with the PSK31 programs but, at least earlier in the day, this was going like gangbusters.

It's evening, and the August weather is taking a toll on the local atmosphere. I am hearing signals that sound like they are coming over the pole. They aren't. They are mostly stateside and Central America. It will most likely only act this way until I am through writing about my favorite of the month.

My main new toy is a program, a freebie, that I downloaded for the PSK31 that nearly everyone else is using. It can be found at the same Web site as the original program furnished by G3PLX, which is also a freebie.

To my first notion, there seemed no difference between the two programs in the ability to communicate. I was soon to learn that the new (to me) Logger program certainly has more bells and whistles, and they are useful for the PSK31 mode and all the other chores you call on the program to perform. It is written for what the name implies. That is, to help keep track of logging contacts.

Additionally, and I haven't yet been able to identify all the features, it cooperates with interfaces to your radio, is compatible with CD *Callbook*-style programs, will interface with your TNC, and will do just about everything but walk the dog. There are 27 definable buttons (it's a Windows program), so you have room to define messages for just about every imaginable type of action, rag chew to contest, and, of course, the brag file.

If you will refer to the screen shot **(Photo A)** you will notice a spectrum analyzer next to the round tuning indicator with the waterfall beneath it in the upper left quadrant of the image. It is small enough in the picture that it is difficult to see what may be happening at the time of the screen shot.

Giant leap

Interestingly, that spectrum analyzer must be no more than 300 hertz wide. When you are tracking a 30 hertz wide signal, it is about an eighth of an inch wide in the center of the analyzer. I found this to be a giant leap ahead in tuning in a signal. Once you carefully bring the signal into the exact position on the scale, there are two vertical lines that turn from red to yellow. The same thing happens to the indicator inside the round tuning indicator.

For years, I have been pretty sure that my "tuner-perfect ear" has told me modern transceivers don't drift enough to make a problem with steady copy during the average transmission. This spectrum analyzer in Logger dispels that theory.

The Logger program contains, just as does the G3PLX program, an automatic frequency control (AFC) that "tunes" the signal while it is in the soundcard as various forces cause a drift. I turned on the AFC and watched as two stations were chatting, and found the signals to drift, according to the indicator, as much as 21 hertz!

All the time, the copy was nearly letter perfect. I noticed that when I did not turn the AFC on, I was continuously tweaking the tuning knob on the transceiver. If this were CW or SSB it wouldn't have made much difference, but since we are working with such a narrow signal, it is no wonder the copy goes away with a little drift. Twenty hertz is over half the width of the signal!

To make things even better, since the station at the other end has to copy you when you begin to transmit, the system automatically adjusts the transmitting frequency according to the drift it detected. Talk about appealing to the lazy guy. This PSK31 just about does it.

You will find the Logger program at the same URL listed in the chart as for the other PSK31 program. You will have to hunt for it. The Web site has frames in it and you will find a listing for "software available," as best I can recall. The problem with frames is that the address of the site you link to when you leave the original page is not listed up at the top of my copy of Netscape.

I don't know if there is a way to fix that, but it makes it difficult to record URLs and pass them on. So I am giving you the starting URL. There is a lot of useful info on PSK31 on the numerous Web sites you can link to, as well as the original. Therefore, it is a good place to start.

Clicking on the *software available* takes you to a screen with links for programs to work with DOS, Windows, Apple, and Linux. I am not sure how all these different operating systems support PSK31, but some genius types must have it figured out. I am reasonably sure a soundcard has to be involved to make any of these programs work. Otherwise, it would seem

Continued on page 44

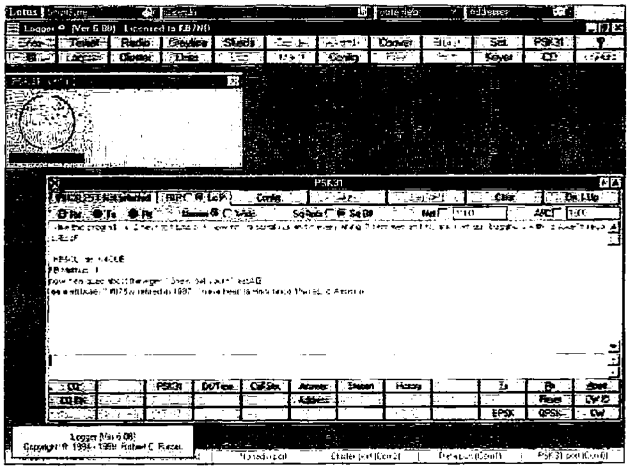

***Photo A.** Talk about bells and whistles! This is just what you use to work PSK31 with Logger. The upper toolbar has to do with logging activities. The window with the circle at one end is the very effective tune system. The window labeled PSK31 pops up from one of those upper buttons. The first time you use it, you will grab the edges and bring it out to size. The 27 buttons at the bottom are all programmable. An excellent PSK31 program, but much more. Could be one of the handiest pieces of software in the shack. (Once we learn to use it all.)*

The Digital Port

continued from page 43

the DSP and narrow bandwidth wouldn't be available.

As I mentioned, I am not sure just how compatible most laptops are with this mode. After all, they do not have plug-in Creative Labs soundcards. They tell me the laptop sound system is meant to emulate the standard Creative Labs fare, but then so are a lot of regular soundcards that just aren't quite compatible with certain software and accessories.

I did run into a few problems. The program installed and started to work as expected, then it got finicky. It didn't respond to clicking certain buttons, and I wasn't satisfied with the height of the displayed signals on the spectrum analyzer. I sent the author an E-mail, and he was very prompt in getting back with a few suggestions.

As (good) luck would have it, I put the laptop through some normal activity, and went back to the Logger program, and things started to work. I can only make some assumptions having to do with a nearly incompatible computer. Obviously, the software doesn't grow bugs and then shed them. And when the software works and you figure out about one tenth of the bells and whistles, it really is a winner.

Learning time

There was a little exercise I had to go through that teaches a few valuable lessons. The answer to getting the reading on the spectrum analyzer easier to read was to increase the audio level. So I brought up the Control Panel in Windows95™ and selected Multimedia. Sure enough, the volume controls are there.

Sliding one of the controls made the spectrum analyzer very easy to read. But, at the same time, the signal to the radio exceeded its limit and I had an overdrive problem. I discovered this for sure during a contact. I found if I used the proper sequence, I could have the volume control panel up at the same time I was transmitting. After some experimenting I arrived at a compromise between the drive to the radio and the spectrum analyzer.

That was a good lesson. However, if I describe it in detail, I am afraid your copy of Windows will vary from mine and it gets confusing. The software folks do list a procedure for setting these controls.

There is one other lesson you must keep in mind. PSK31 is still very new. Most of the contacts you make are with hams who only have a few weeks more experience than you. It is difficult for the fellow at the other end to give you sound advice according to what he sees displayed on his screen. You are a pioneer on the cutting edge as soon as you get this software and a few cables plugged in and make a contact.

There are a lot of rigs out there, and each has its own peculiarities. Some of them are a little more difficult to prod into operation with this new mode. The problems include overdrive of both the computer on receive and the transmitter on send. Most of the time, this is handled by using the accessory jack on the rear of the transceiver.

In the case of the ICOM 735 here, it has worked out well both to the desktop and the laptop from the accessory jack with simple, straightforward cabling. Some very good older transceivers do not have this convenience, and it is necessary to use the microphone input and the speaker output to interface with the soundcard.

There are numerous instructions for attenuators (found on the Internet links) to get the correct level of audio going between the radio and the computer. I noticed a recent article in the August issue of *73* where the ElectroKit people are furnishing a kit to overcome this dilemma, and that kit shows up on this same Web site I am referring you to. It sells for about $15, or you can buy it assembled for about $25. Sounds like a cool move by someone answering a need.

I still recall an old WWII surplus CW filter that was 20 cycles wide! That is so vivid to me. The real remembrance of that piece of equipment was of the drift on the old Hallicrafters receiver I had that would allow a CW signal to pass through that narrow bandwidth and be readable for approximately a half minute. Then it was time to go hunting again.

There is no comparison to that old-timer when I work with this ICOM 735 or any other modern-day transceiver. And we do work with each other's equipment when we communicate with these new modes because if both rigs aren't stable, the communication stops right away. You seldom hear of complaints of drift these days on most (other) modes.

Local packet

I attempted to find a simple solution to the local packet demise and there doesn't seem to be an

Current Web Addresses

Source for:	Web address (URL)
HF serial modem plans + software	http://www.accessone.com/~tmayhan/
SV2AGW free Win95 programs	http://www.forthnet.gr/sv2agw/
BayCom — German site	http://www.baycom.de/
Pasokon SSTV programs & hardware	http://www.ultranet.com/~sstv/lite.html
New Mode — PSK31 — Free download	http://aintel.bi.ehu.es/psk31.html
Baycom 1.5 and Manual.zip in English	http://www.cs.wvu.edu/~acm/gopher/Software /baycom/
Source for BayPac BP-2M	http://www.tigertronics.com/
TNC to radio wiring help	http://freeweb.pdq.net/medcalf/ztx/
ChromaPIX & ChromaSound DSP software	http://www.siliconpixels.com/
Timewave DSP & AEA products	http://www.timewave.com
International Visual Communication Association — a non-profit organization dedicated to SSTV	http://www.mindspring.com/~sstv/
XPWare — TNC software with sample download	http://www.goodnet.com/~gjohnson/
Auto tuner and other kits	http://www.ldgelectronics.com
TAPR — lots of info	www.tapr.org
Creative Services Software	www.cssincorp.com

***Table 1.** The infamous URL chart.*

Number 45 on your Feedback card

Above & Beyond

VHF and Above Operation

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The Internet, a new frontier

The Internet and computers in general have promoted a big explosion in information available to the general public and amateur radio as well. While the Internet started out as a scientific forum for technical exchange, it has blossomed into everyone's lives at a most common level as computers and the everyday people use it to expand their horizons. It seems to me that I have become very much attached to my computer and my Internet provider as a source of information and contacts via E-mail.

Consider that answering a question from an interested amateur by postal mail is a one-on-one happening. If the letter gets printed in a column such as this one, everyone who reads the column is exposed to the information. On the Internet, there are "reflectors" where questions or information can be shared with a large group of interested amateurs. This "reflector" is normally devoted to items of interest to a particular group of individuals who subscribe. It's like asking a question to 1000 or so other amateurs who have similar interests. And it's like having a free calling card to a "Mr. Wizard" who might just have information pertinent to your question.

I don't pretend to be all-knowing about the Internet, as I am just experimenting with it myself for just pure enjoyment. There are so many different avenues for search and research, with interesting Web sites to explore to broaden your perspective, be they wide ranging or cover just a narrow field of interest. In my case, it's amateur radio and its applications to the upper frequencies in the microwave realm. This is a specific point of interest, but it's still varied in many different directions such as EME communications, SETI searches, radio astronomy, weak signal microwave, construction, and much more.

What you need to know to start to explore is who you can contact and what information you can obtain on the Internet. Well, if you are just starting to explore, here are a few addresses that will provide you with more information than you can shake a stick at or print in a day. Some of these locations point to other locations (links) of common interest, so this is just a beginning of amateur-related sites to explore.

Amateur Internet sites

[http://www.ham-radio.com/sbms/] — San Bernardino Microwave Society.

[http://www.g3pho.free-online.co.uk/microwaves/] —

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easy fix. It is just going away in this neighborhood. I have taken my portable packet station and driven about checking old listings, and nothing answers.

Ah well, good things have a way of decaying if they don't keep up with the times. I suppose I just have to look at my own experiences with expecting dependable communication via the system. I was just telling a fellow the other day if I sent an important message by packet, I followed up with some regular E-mail just to check to see if it arrived. The success rate was lessening rapidly.

I think the packet system has taught us a lot, though. In the '80s, that was pretty high tech. There wasn't much available to so easily pass messages, and it was a lot of fun. I would often search message headers and find useful information or someone searching for a bit of info I could pass on. I would still be doing it if I could, which means that some lingering bit of nostalgia made an impression.

URL changed

I got an E-mail from Dave W9CGI a week or so ago. He found a problem with the listing in the URL chart for the TNC-to-radio hook-ups. It seems the address had been changed and there was a convenient forwarding address but the Web page couldn't be found on the new URL. Dave tried it and so did I.

I contacted Gloria KA5ZTX, and she supplied the correct address. So that little problem is solved. Let me know when things like that happen. That chart is probably the most important reference in this column. Incidentally, that Web site, as I recall, has a book that sounds like the answer to many of these interface problems. I should take a look and let you know. Plus, there are some valuable hints on the site about working digital modes.

FYI — you don't have to cave in to the "monopoly"

There has been a lot of fuss over the various big guns in the Internet browser/service provider business — about how they take advantage of folks when they log on to the Internet. It seems that Netscape has been accused of hogging the action as the opening screen.

It never occurred to me what a problem that must appear to some folks. Honestly, I learned very early in the Netscape browser usage to set the browser so it opens with a blank screen. With the latest version I have (4.x), when this was accomplished it made an extra step (sorta) in that the browser has to be told to go on-line after it comes up. Otherwise, it won't look for anything out there in the world. I don't recall the steps to get rid of the auto-load of an opening screen but it is covered in the documentation.

So, recently, there was a questionnaire of preferences from Netscape, and suddenly I realized all the things I had missed in recent years by not going and reading and following the crowd. There really is nothing wrong with providing users with something to occupy their minds. But some of us already think our minds are full of the things we want there. Sometimes, "enough" is best determined by the consumer.

Everybody's doing it

I was reading a recent issue of *The Vision Newsletter* from the International Visual Communications Association, which is primarily meant to promote SSTV. There were some interesting activities, including an International SSTV DX contest that attracted more hams than I realized were involved in SSTV.

Two other topics caught my eye. One, there are awards now for Worked All States in various combinations including QRP. That QRP sounds enticing. Well, maybe more like a tough row to hoe even for someone with a *lot* of patience. Whoever wins that award will earn it.

The second notable article was about a half page devoted to PSK31. I guess it is true for more than just you and me. If any ham succumbs to the challenge of one of these modes, he is in for the long haul — gotta try 'em all.

If you have questions or comments about this column, please E-mail me at [jheller@sierra.net]. For now, 73, Jack KB7NO.

Peter G3PHO/Radio Society of Great Britain. Lots of links to other amateur locations and microwave points of interest, with pictures and very interesting microwave news.

[http://www.nitehawk.com/rasmit/] — W6/PAØZN. EME, SETI, astronomy, microwave. Another excellent site devoted to R&D interests and information sharing among the amateur community.

[http://www.nitehawk.com/rasmit/50UP.html/] — 50 MHz and Up Group, San Francisco Bay area.

[http://www.ourworld.compuserve.com/homepages/edmunn/] — Home page of Ed Munn W6OYJ (member, San Diego Microwave Group).

[http://www.qsl.net/wb9ajz/laser/] — WB9AJZ Web page on laser communications.

[http://solar.uleth.ca/solar/www/realtime.html] — Near-real-time MUF map.

[http://www.geo.mtu.edu/weather/aurora/] — The aurora page, including how it works.

[http://www.pfrr.alaska.edu/~ddr/ASGP/STRSCOOP/AURORA/EXPLA4.HTM] — Very interesting information concerning auroras and how they function.

Commercial locations

Most of these commercial Web pages require no introduction, as they are self-descriptive in their addresses.

[http://www.icomamerica.com/] — ICOM America.

[http://www.yaesu.com/] — Yaesu.

[http://www.kenwood.com/] — Kenwood.

[http://www.jameco.com/] — Jameco Electronics (parts).

[http://www.allied.avnet.com/] — Allied Electronics (parts).

[http://www.hp.com/] — Hewlett-Packard.

[http://www.rfparts.com/] — RF Parts Co. Great source for hard-to-find component parts, tubes, and devices for HF through SHF. RF power devices, switches, and other items.

[http://www.w7fg.com/] — Manuals.

[http://www.ramsey.com/] — Ramsey Electronics. Amateur test equipment and kits.

[http://www.nec.com/] — NEC Semiconductors (California Eastern Labs, supplier of NEC devices).

[http://www.shfmicro.com/] — SHF Microwave Supply. Supplier of microwave parts and Gunn diode oscillator devices, both new and some used.

[http://www.downeastmicrowave.com/] — Down East Microwave (DEM, supplier of 50 MHz and up amateur equipment, and home of microwave no-tune converters).

[http://209.239.34.153/murphyjunk/home] — Mike Murphy Surplus Electronics, a local haunt here in San Diego with lots of test equipment and pieces parts in general.

[http://rio.bldrdoc.gov/timefreq/] — WWV, Boulder CO. NIST time and frequency home page.

[http://www.arrl.org] — ARRL headquarters Web page.

Well, there are a lot of addresses to check out that range from amateur suppliers to kit manufacturers to bulletin boards for amateur interest groups and surplus dealers. These by no means comprise the entire list, but rather a sampling of addresses I have observed, purchased material from, or used for technical information.

If you use your imagination, you can come up with addresses by using search engines such as: [http://www.yahoo.com/], [http://www.hotbot.com/], [http://www.bigfoot.com/], and [http://www.lycos.com/].

Call up these search engines and follow the bouncing ball. Each has a different personality and skill in finding slightly different things that you might want to do research on. Give them a try, but don't be too broad in your scope or so much will come up that you will not have a meaningful session. I once tried "Indian" and I received over 15,000 suggestions. Be more specific in your request by using a tribe name or specific item.

Using "amateur radio", I came up with 44 hits and 1477 sites for information. Refining the search to "amateur radio + microwave", I got 15 hits, one of which was Down East Microwave's site listed above. A very interesting site included in this listing was that of Bats, Cats, and Rats, which stands for Bay Area Telecommunications System, California Amateur Telecommunications System, and Radio Amateur Telecommunications System. This site is prolific in directing you to many different varied points of interest such as DX, clubs, professional organizations, commercial, state organizations, emergency, and amateur-related sites of interest. This is a very organized site, so give it a try at [http://www.kf6ny.org].

The amount of information you can gather by searching these and other sites is so vast that it boggles the mind. Don't let the keyboard and Internet access stop you from exploring these and many more interesting Web pages and locations on the Internet. The many varied points of interest can serve you very well with information or just with fun in surfing the Web.

By bringing up manufacturer's Web pages, you can research their specifications on component parts and obtain a copy of their data sheets. This has proven to be of great interest to me, as having semiconductor data manuals on all the component parts we use these days means having so much paper on the shelves that it can get overwhelming. I have quite a time trying to find one data manual at times in this sea of data books. Calling up the manufacturer, let's say NEC for instance, I am at their data book on-line and can browse about it looking for a device or call up an exact part and see its data almost immediately.

For work, I needed a data sheet on a particular item from a company in Canada. Searching the Web for that company, I found them and inserted the product I was looking for in their query search box on their Web page. It gave me the entire 12-page document, including module schematic and specifications in an Adobe Acrobat "pdf" file format to download. Was I impressed with this file transfer method! The file compression requires an Adobe Acrobat program that costs a few hundred dollars, but it's worth it. The program to open and expand the received "pdf" file is a free download file program available from Adobe Acrobat on their Web site [http://www.adobe.com].

This is a software company and they have many other programs that they offer for sale, but the Adobe Acrobat Reader program is available from them for free downloading from their Web site. I have purchased their program to encode documents and other material into the "pdf" format for transmission, and am in the process of learning how to utilize the software.

Addresses of microwave interest not mentioned before

[http://iacs5.ucsd.edu/~jkeyzer/projects.html] — Jeff Keyzer's page. Lists San Diego Microwave Group 10 GHz transceiver conversion project, double conversion 992 MHz/144 MHz, IF freqs, synthesizer-controlled.

[http://www.ham-radio.com/wa6cgr/mwpll.html] — Description of a microwave phase-locked loop/brick oscillator by WA6CGR.

[http://www.tapr.org/~n6gn/ocar/n6izw.html] — Description of SDMG's 10 GHz microwave X-band repeater.

Methods of searching on the Internet

Well, searching the Web on these "search engines" (as I learned to call them) such as Yahoo is not difficult. Like I said, all you have to input is a

Number 47 on your Feedback card

CALENDAR

Listings are free of charge as space permits. Please send us your Calendar Event two months in advance of the issue you want it to appear in. For example, if you want it to appear in the January issue, we should receive it by November 30. Provide a clear, concise summary of the essential details about your Calendar Event.

OCT 16

GODFREY, IL The Lewis & Clark Radio Club will hold their Midwest Amateur Radio & Computer Expo at the Lewis & Clark Community College in Godfrey IL, in the River Bend Arena. Free parking. Indoor flea market, commercial vendors, all handicap accessible. Doors open at 8 a.m. Setup Fri., Oct. 15th after 6 p.m., or Sat., Oct. 16th at 6 a.m. Tables $10 each; call *(618) 254-9465* for reservations. VE exams: Pre-registration is required for "No Code" exams. Walk-ins are okay for all other class exams. For pre-registration or info call *Rich Morgan KF9F, (618) 466-2306.* For info and tickets, write to *Lewis & Clark Radio Club, P.O. Box 553, Godfrey IL 62035; or call (618) 466-1909.* Talk-in on 145.230 and 442.225. E-mail *[N9WHH@ezl.com]*. Visit the Web site at *[http://WWW.EZL.COM/~LMILLER/LCRC.HTML]*.

GRAY, TN The 15th Annual Tri-Cities Hamfest will be held by the Kingsport, Bristol, and Johnson City Radio Clubs, on Sat., Oct. 16th, at the Appalachian Fair Grounds, located off I-181 in Gray TN. A large drive-in indoor and outdoor flea market space is available. RV hookups. Admission is $5. Mail inquiries to *P.O. Box 3682 CRS, Johnson City TN 37602.*

OCT 17

KALAMAZOO, MI The 17th Annual Kalamazoo Hamfest will be held at the Kalamazoo County Fairgrounds, starting at 8 a.m. Vendor setup at 6 a.m. Advance tickets $3, $4 at the door. Trunk sales $5. For tickets/tables, send SASE to *Gary Hazelton N8GH, 75075 M-40, Lawton MI 49065.* For contact or info, check the Web site at *[www.qsl.net/ka8blo/hamfest.html]*; or E-mail *[ka8blo@net-link.net]*.

SELLERSVILLE, PA The RH Hill ARC Hamfest will be held at the Sellersville Fire House, Rte. 152, 5 miles south of Quakertown and 8 miles north of Montgomeryville PA. Talk-in on 145.31. Admission $5. VE exams 10 a.m.–1 p.m., all classes. Please bring documents. Indoor flea market spaces $12, table included. Outdoor spaces $6, bring tables. For further info, call the Hamfest Hotline: *Linda Erdman (215) 679-5764; 2220 Hill Rd., Perkiomenville PA 18074.* Web site: *[HTTP://WWW.RFHILL.AMPR.ORG]*.

OCT 23

RICKREALL, OR The Mid-Valley ARES, of Salem OR, will present its 5th Annual Swap-Toberfest and Amateur Radio Emergency Services Convention at the Polk County Fairgrounds on Sat., Oct. 23rd. Talk-in on the 146.86(-) rptr. Doors will be open for the convention 9 a.m.–3:30 p.m. Swap table setup will be 6–9 p.m. Fri. night, Oct. 22nd, and on Sat. morning, Oct. 23rd, at 7 a.m. Only 2 pre-registered participants allowed per table during setup; all must register. Self contained RV spaces available, $10 per night. Commercial vendor space $25 (for 2 tables). Mail to *Mid-Valley ARES, P.O. Box 13848, Salem OR 97309.* Pre-registrations post marked by Oct. 8th will receive an extra door prize ticket with each registration. Registrations received Oct. 16th or later will be held for pick-up at the door. Features include meetings and seminars. Additionally, emergency communications vehicles will be on display from Marion and Polk County Emergency Management, Civil Air Patrol, American Red Cross, the Oregon State Police, and others as available. Advance tickets $5, $6 at the door. Age 12 and under free. Non-power swap tables $13 each (do not mix non-power with power). Power swap tables $15 each. For more info contact *Bob Boswell W7LOU, (503) 623-2513; or E-mail to [w7lou@goldcom.com]*. To download a copy of the flyer and pre-registration form, surf the Net for *[http://www.teleport.com/~n7ifj/swaptobe.htm]*.

OCT 24

LEBANON, IN The Boone Co.–Clinton Co. ARC will hold a hamfest at Boone County Fairgrounds, 8 a.m.–1 p.m. I-65 to Exit 138. VE exams nearby, 9 a.m.–11 a.m. For table reservations, contact *Sue Youkey N9NVE, (765) 436-2565 or E-mail [WK9D@in-motion.net]*. For more info contact *Sara L. Lecklitner KB9OEZ, (765) 482-9152.*

OCT 30

WATERFORD, CT An auction will be held at the Senior Citizens Center in the Waterford Municipal Complex on Route 85. The event is sponsored by the Tri-City ARC Inc., and is open to the public at 10 a.m. Setup begins at 9 a.m. Handicapped accessible. Bring your equipment to be auctioned. Admission is Free. Talk-in on 146.97. For more info, contact *Austin Wolfe AA1SV at (860) 443-2459.*

OCT 31

DES MOINES, IA The Tikva Tracers ARC will host "Hamfest Iowa '99" in the 4H Building at Iowa State Fairgrounds in Des Moines. Talk-in on 146.22/.82. Seminars and "Ask the Experts" will be featured. Setup Saturday, 6 p.m.–9 p.m., and 6 a.m. on Sunday. Doors open Sunday at 8 a.m. One table for $10, $8 for each additional table. Electric $8. VE exams at 9:30. Contact *Cass Nemmers NØYMU, 670 36th St., Des Moines IA 50312; tel. (515) 277-6346; E-mail [hamfestiowa@juno.com]*.

NOV 6

BELLEVILLE, IL The Scott Composite ARS, KB9PAU, will sponsor its 1st Annual Hamfest at the main campus of Belleville Area College,

Continued on page 50

topic and you should get some hits. To help you be more specific on searching, here are a few tips on requesting information.

First, use the correct spelling of the word you want to locate. The first time, I typed "nite-hawk" spelled wrong. You would not believe what Web page came up. I will leave that one to your imagination.

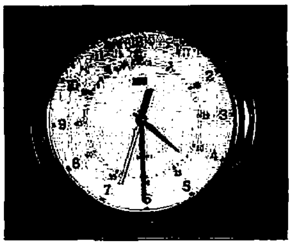
If it's spelled wrong, you miss your opportunity. Use several words to describe what you want to search for, such as red-hot tacos. In this case, you will get a hit for each word individually: red, hot, and tacos. If you want only red-hot tacos, then use quotation marks and you will get only "red-hot tacos" hits that contain those words in that order.

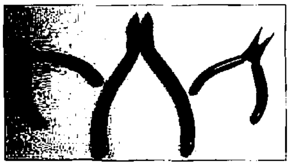
Another trick is to use (+) or (-) signs. For example, + "red hot tacos" - "recipes". In this case, you want only red-hot tacos but nothing to do with recipes. This way, you can be more selective in your search. Another tip is to use lower case so that you will find matches in *either* lower or upper case; if your search is capitalized, it will not return hits that are in lower case.

There are many other methods that are too numerous to be included here, but what you have been given will provide you with lots of enjoyment and a great deal of information on whatever subject you care to explore. If you want more information, try searching for "how to search" and see what you get. I haven't tried it, but I suspect that it might lead to success. Give it a try. Happy "amateur radio" + "microwave" surfing on the Web. Best 73, Chuck WB6IGP.

Number 48 on your Feedback card

NEW PRODUCTS



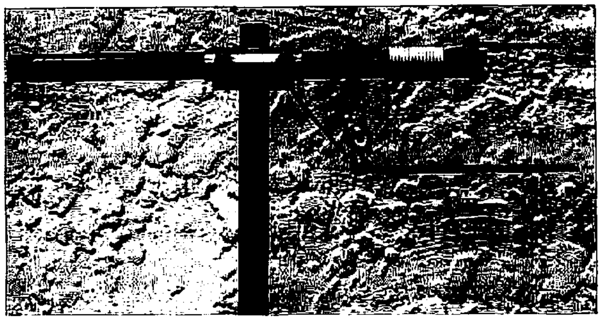


Mini News from MFJ

• MFJ's new model MFJ-126 is a beautiful quartz wall clock with a clear, clean, and highly visible 12-inch-diameter face. It's easily seen from 15–20 feet away. Also featured is a 24-hour trimline.

• New "Helping Hands" kit tools include (left to right) the MFJ-7104 4-inch tapered head diagonal cutter pliers ($6.95); MFJ-7106 6-inch all-purpose standard beveled edge wire cutters ($11.95); and MFJ-7114 4-inch needlenose pliers ($6.95).

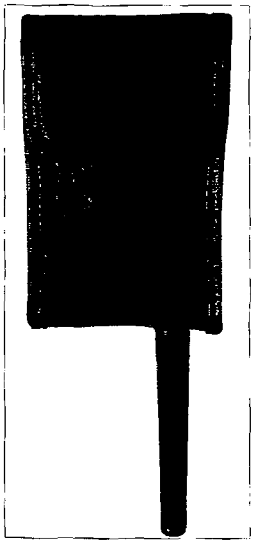
• In addition, the Helping Hands bench assistant with 2-inch magnifier holds objects at any angle and leaves both hands free. #VEC-7400, $14.95.



Bilal's Isotron 6

Bilal Company has announced that the new Isotron 6 for 6 meters is now available. With a bandwidth of 1.25 MHz at 10 W (may vary with environment), its compact design is 16.5 inches long by 2 inches wide by 4 inches high. Center frequency coverage is 50 to 54 MHz in two configurations, and two capacitive hats are supplied (50–52, 52–54 MHz). Feedline is 50 ohm coax, and pattern is omnidirectional with random polarization. Mount in any position; vertical gain will depend on height above ground.

For further information on this and other Bilal products, please contact Bilal Company, 137 Manchester Dr., Florissant CO 80816; tel. (719) 687-0650; [www.catalogcity.com], keyword Isotron.



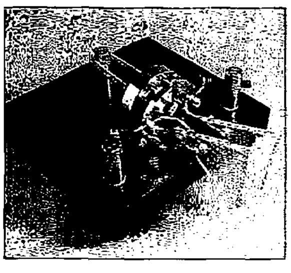
Quick Draw Holster

The PowerPort Quick Draw holster from Cutting Edge has a few features that none of the other pouches around have. For one thing, it securely clips onto your belt and will not come off when you pull your HT out. And, it's made to hold your radio in the antenna-down position, which is much more comfortable and doesn't affect performance. $19.95. For details and model availability, contact Cutting Edge Enterprises, 1803 Mission St., Ste. 546, Santa Cruz CA 95060; tel. (800) 206-0115; E-mail [cee@cruzio.com].

PowerSafe 2000

It won't take a millennial shutdown to put Cutting Edge's PowerSafe 2000 power supply to good use. With the simple addition of that spare 12 V automotive battery in your garage or a deep-cycle marine battery, you can have a complete AC and DC power station. This compact and powerful 12 V rechargeable system offers a beefy 600 W (1200 W surge) of AC power and up to 200 amps of DC power. The PowerSafe 2000's sturdy vented battery enclosure is suitable for safe indoor use. Three AC outlets, a three-port DC cigarette outlet, automatic circuit breaker, male cigarette plug to energize y our equipment, and a fully automatic charger are all included. Dimensions are 18 x 10.5 x 9.5 inches. PS2000, reg. $369.95, sale $299.95.

For further details, contact Cutting Edge Enterprises, 1803 Mission St., Ste. 546, Santa Cruz CA 95060; tel. (800) 206-0115; E-mail [cee@cruzio.com].



Dual Paddle from China

Morse Express has announced the availability of a new dual paddle imported directly from China. At $79.95, it is among the least expensive of the "real" paddles — that is, heavy-duty and built to last. The Quadriom TA-1, made by the Quadriom Company in WuXi, uses a cantilever design (similar to Bencher and G4ZPY paddles) with steel needle bearings and nylon bearing seats. Contact spacing is adjusted by ordinary slotted-head screws, and held in place by set screws so that once proper adjustment is achieved, it can be locked in tight. Approximately 3-3/4 x 4 inches, 2-1/4 lbs.

For further information, contact Morse Express, Milestone Technologies, 2460 South Moline Way, Aurora CO 80014-1833; tel. 303-752-3382; E-mail [n1fn@MorseX.com].

CALENDAR

continued from page 47

Carlyle Rd. (Rte.161) and Green Mount Road in Belleville. Dealer tables are $10, tailgaters are $5. Dealer and tailgater setup 7 a.m.–8 a.m.; open to the public at 8 a.m.–2 p.m. General admission $4 at the door, $3 in advance. VE exams on-site, must be pre-registered. Talk-in on 147.120 on the St. Clair County Amateur Radio Club repeater, K9GXU. There will be workshops on emergency communications and the missions of Civil Air Patrol. Get tickets and pre-register by E-mailing senior member *Skip Mize KA9VKE at [fiuinc@peaknet.net], or calling (618) 277-9767.*

ENID, OK The Enid Hamfest Group will present a Hamfest on Nov. 6th in the Hoover Building at Garfield County Fairgrounds, Oxford & 4th. This event will be open to the public 8 a.m.–5 p.m. Admission $2. Tables $1 each. There will be a free doughnut and coffee in the morning, free hot-dogs and soda at noon. VE exams at 1 p.m. Contact *Tom Worth N5LWT, (580) 233-8473, E-mail [N5LWT@HOTMAIL.COM]; or Fred Selfridge N5QJX, (580) 242-3551, E-mail [FREDNNEL@IONET.NET].*

MYRTLE BEACH, SC The Grand Strand ARC is going back to basics for "Beachfest 99," with an outside fleamarket and tailgate-ONLY hamfest. No entry fee for visitors. Only $5 per spot for vendors. XYL cake and pie raffle only $1 per ticket. The event will be located at the Old Myrtle Beach Air Force Base just off Hwy. 17. Plenty of parking and vendor spots. The club will do the cooking for lunch, and there is a breakfast special large sausage biscuit w/ beverage for only $1.75. VE exams on-site in the Red Cross building, starting at 11 a.m. Contact *[WØRXR@w4gs.org]* for more info. Directions: US 501 to 17 By-Pass, go south on by-pass to the 2nd traffic light (about 3 miles). Turn left at the light and follow the signs.

SORRENTO, FL The Lake ARA's Hamfest and Computer Show will be held on Saturday, Nov. 6th at the East Lake Chamber of Commerce Building, located in Sorrento. Admission $5 per person. VE Exams, walk-ins only, at 10 a.m. Talk-in on 147.255. Inside vendors, $10 per table, includes one admission ticket. Tailgating $5 per vendor. For reservations and further info, contact *Chuck Crittenden KE4EXM, P.O. Box 615, Altoona FL 32702. Tel. (352) 669-2075, E-mail [capias@gate.net].*

WAUKESHA, WI The Milwaukee Repeater Club will sponsor its 15th annual "6.91 Friendly Fest" on Saturday, Nov. 6th, 8 a.m.–1 p.m. Sellers setup at 5:30 a.m. The Fest is being held at Waukesha County Expo Center Arena Forum, N1 W24848 Northview Rd., Waukesha WI. I-94 to County J, south to FT, west to Expo. Tickets $5. 4-ft. tables $5. Please call *Mike N9NPB at (414) 367-3953.* Send an SASE with payment to *The Milwaukee Repeater Club, P.O. Box 2123, Milwaukee WI 53201. Web page [http://www.execpc.com/~mrc/friendlyfest.htm].* Talk-in on 146.91(-) (The Friendly Repeater), and on 146.52. On-site VE exams.

NOV 7

KAUKAUNA, WI The Starlite Club at the corners of Hwy. 55 and Cnty. Rd. JJ, is the location for the Fox Cities ARC Annual Hamfest on Nov. 7th. Doors open at 8 a.m.; setup is at 6 a.m. Power available. You must buy an admission ticket if you pre-register. Advance tickets $4 each, 8-ft. tables $8 each. Send check or money order payable to *FCARC, 1912 Russett Ct. Apt. #7, Appleton WI 54914, Attn: Chad Pennings N9PRC, Hamfest Chairman. Tel. (920) 993-0485.* Advanced adm. must be received by Oct. 31st. VE exams: registration 8 a.m.–9 a.m., no walk-ins after 9 a.m. Bring original license plus (2) copies and photo ID. For more exam info contact *Cathy Keating N9FZL, (920) 766-3091.* Talk-in on 146.52 simplex.

LINGLESTOWN, PA The Central Pennsylvania Repeater Assn. 1999 Hamfest will be held at Linglestown's Fire Hall, Sunday, Nov. 7th, starting at 8 a.m. Handicapped accessible. VE exams on-site, compliments of HRAC. Call *Harold Baer KE3TM, 619 W. 2nd St., Hummelstown PA 17036, at (717) 566-8895* for table reservations. General admission $5. Tailgaters and vendors admitted at 6 a.m. Sunday. Talk-in on 145.470 and 146.520 simplex.

NOV 13

MONTGOMERY, AL The Montgomery ARC will host the 1999 Alabama ARRL Convention at the 22nd annual Montgomery Hamfest and Computer Show in Garrett Coliseum at the South Alabama State Fair Grounds, located on Federal Drive in the North Eastern section of Montgomery. Admission $5, free parking, all indoors, including the flea market. Flea market setup 3 p.m.–8 p.m. Nov. 12th, and 6 a.m.–8 a.m. Nov. 13th. Doors open to the public 9 a.m.–3 p.m. CST. VE exams on-site beginning at 8 a.m. Bring original and a copy of your current license, picture ID and $4. Talk-in on 146.24/.84, W4AP. Ragchew 146.32/.92 (with phone patch, *up/#down), 147.78/.18, 449.50/444.50. Flea market reservations required to ensure table. Tailgaters welcome, $5 per vehicle space. For more info write to *Hamfest Committee, c/o 2141 Edinburgh Dr., Montgomery AL 36116-1313;* or phone *Phil at (334) 272-7980 after 5 p.m. CST. E-mail [wb4ozn@worldnet.att.net.* Visit the Web site for late-breaking news and events, *[http://jschool.troyst.edu/~w4ap/].*

NOV 13–14

FT. WAYNE, IN The 27th Fort Wayne Hamfest & Computer Expo will be held Nov. 13th and 14th at the Allen County War Memorial Coliseum Exposition Center. Sponsored by the Allen County Amateur Radio Technical Society. Hours: Saturday 9 a.m.–4 p.m. EST; Sunday 9 a.m.–3 p.m. EST. No advanced ticket sales. Admission $5 at the door only. 11 years old and under free with an adult. Coliseum parking, $2 per vehicle. Talk-in on 146.88(-). New and used ham dealers. Computers and software. Forums and meetings. Flea market tables, 8 ft., $20 each. Premium tables, 8-ft., $40 each. $27.50 for electricity (110V 20A). For info or table orders, send an SASE to *ACARTS/Fort Wayne Hamfest, P.O. Box 10342, Fort Wayne IN 46851.* For more table info, call *(219) 483-8163.* For general info, call *(219) 484-1314.* Visit the Web site at *[http://www.acarts.com].*

NOV 19–20

OCEAN SPRINGS, MS The West Jackson County ARC will hold its annual Hamfest/Swapfest at the St. Martin Community Center north of Ocean Springs. The hamfest will be open to the general public from 5 p.m.–9 p.m. on the 19th, and 8 a.m.–2 p.m. on the 20th. Admission will be $2 per adult or $4 for an entire family. Take Exit 50 South from I-10 at Ocean Springs. Follow Hwy. 609 to the second light. Turn right on Lemoyne Blvd., and the Community Center is 1 mile on the right side. Free parking. RVs may park overnight if they are completely self contained. There are several motels in the vicinity of Exit 50. 8 ft. tables are $5. Advanced deposits are required for sales table reservations. Talk-in on 145.11(-) MHz, N5OS. VE exams will be held at 11 a.m. Saturday. Bring photo ID, the original license, and a photocopy of that license. The testing fee is $6.45. Contact *Phil Hunsberger W9NZ, 1207 Lancelot Lane, Ocean Springs, MS 39564, tel. (228) 872-1499; or call Stan Hecker N5SP at (228) 875-0222.*

NOV 20

GOLDEN, CO The 1999 RMRL Hamfest will be hosted by the Rocky Mountain Radio League, Inc., November 20th, 8 a.m.–2 p.m., at Jefferson County Fairgrounds, 15200 W. 6th Ave., Golden CO (Indiana Exit from 6th Ave.). Talk-in on 144.62/145.22 MHz. Admittance $4 per person; tables $10 in advance or at the door. VE exams, ARRL forum. Contact *Ron Rose NØMOJ, (303) 985-8692; E-mail [nØmqj@arrl.net].*

NEWTONVILLE, MA The Waltham ARA/1200 RC Auction and Ham Social will be held Saturday, Nov. 20th on the 2nd floor of the Newton Masonic Hall, 460 Newtonville Ave., Newtonville MA (the corner of Walnut St. and Newtonville Ave., across from the Star Market). Metered parking on the streets. Masonic Hall lot reserved for other occupants of the building. Stay away from the Star Market lot, or they'll tow your vehicle. There is free parking in the municipal lot a block away. Admission

HAMSATS

Number 51 on your Feedback card

Amateur Radio Via Satellites

Andy MacAllister W5ACM
14714 Knights Way Drive
Houston TX 77083-5640

Photo A. *The Phase 3D satellite from AMSAT takes a ride in August from Florida to Maryland for vibration testing. Lou McFadin W5DID and Stan Wood WA4NFY pack it in. (W3IWI photo)*

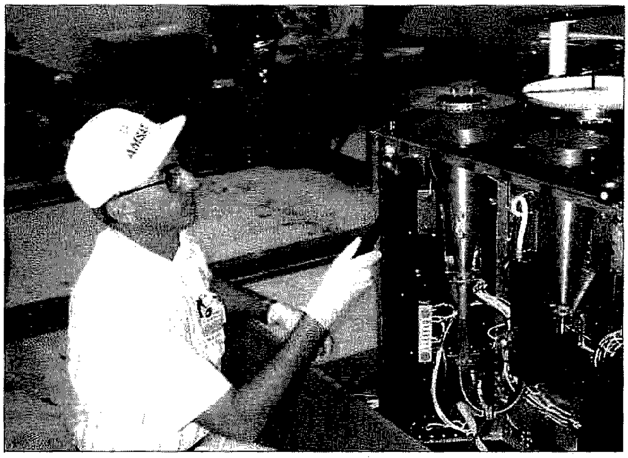


Photo B. *In Maryland at the Goddard Space Flight Center, Stan Wood WA4NFY makes a few adjustments to Phase 3D. (W3IWI photo)*

Amateur radio satellite activity is ready for a change, and it's coming fast. Phase 3D is done, it's ready for flight, and optimism is high for launch in the near future. While many hamsat enthusiasts have been watching and waiting for Phase 3D, there's been a quiet, deliberate campaign by other ham groups and educational institutions to design, build, and get launches for a new and exciting crop of satellites.

The good ...

Have you heard of JAWSAT, ASUSat-1, OPAL, FalconSat, or StenSat? These are a few of the good, new satellites scheduled for flight later this year, from Vandenberg AFB in California. They are to be launched together in a rather curious configuration.

JAWSAT is a name given to a device called the Multi-Payload Adapter (MPA). The name "JAWSAT" is probably derived from its shape, with openings around its periphery for the attachment of other satellites, like ASUSat-1, OPAL, and FalconSat. While JAWSAT may be the "mother ship" for these satellites, it also carries several cameras to monitor the deployment of the "child" satellites and a ham-radio store-and-forward communications experiment for use after deployment is complete.

ASUSat-1 is an Arizona State University NASA Space Grant project. It has been called a "nanosat" due to its light weight (around 10 lbs.) and small size. Although it is primarily a test bed for student experiments, it also carries a digital and an analog (voice) amateur-radio system on Mode "J" (two meters up and 70 cm down). Check out the ASUSat Web site at:

[http://www.eas.asu.edu/~nasasg/asusat/main_asusat.html].

OPAL is the second SSDL-SQUIRT (Space Systems Development Laboratory's Satellite

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$2. Talk-in on 146.64(-) Waltham rptr. Seller check-in starts at 9:30 a.m. For directions and further info, visit the WWW site at *[http://ourworld.compuserve.com/homepages/emayer/auction.htm]*, or contact *Eliot Mayer W1MJ, (617) 484-1089; E-mail [w1mj@amsat.org]*.

SPECIAL EVENTS, ETC.

OCT 17

CINCINNATI, OH A Special Event Station will operate 10 a.m.–6 p.m. to commemorate Cincinnati OH's "Tall Stacks 99." The station will be operated from on board the *Belle of Louisville* Steamboat Paddlewheeler, by Nelson WB8VUU and Paula KA8HQJ DiGennaro of Huber Heights OH. The station will be carried on the Fairfield ARA's 145.19(-) wide area repeater, which covers up to seven states. They will operate under their individual callsigns. A commemorative QSL card will be offered to those making contact with KA8HQJ or WB8VUU. Send your QSL info along with an SASE to *Tall Stacks Special Event Station, 7136 Pineview Drive, Huber Heights OH 45424-2556 USA.* Allow up to 30 days for return of the commemorative QSL card.

OCT 31

BREVARD, NC The Transylvania County ARC will operate K4HXZ from Transylvania County NC on Halloween. Hours of operation will be from 1800Z until 2359Z on Oct. 31st. Frequencies will be 7.237, 14.295, 21.365, and 28.335 SSB, and 146.52 FM simplex. For certificates, send a business size or 9 x 12 SASE to *T.C.A.R.C., P.O. Box 643, Brevard NC 28712 USA.* Weather permitting, operation will be from The Devil's Courthouse on the Blue Ridge Parkway.

NOV 11

ALBUQUERQUE, NM Station N5VA will operate from the Veterans Medical Center on Veteran's Day, Nov. 11th. Operation will be 16:00 UTC–04:00 UTC on 14.287, 21.325, 18.130 and 7.245 MHz, or as close to those frequencies as possible. For a 9" x 11" certificate, please send a large SASE to *VA Medical Center, 1501 San Pedro Dr. SE 117D, Albuquerque NM 87108 USA.*

NOV 20–22

VALE ISLAND, NORTHWEST TERRITORIES In celebration of the 5th Anniversary of the US Islands (USI) awards program, VE8JR will be active exclusively around 28.495 from Vale Island. Operation will take place during the ARRL November Sweepstakes Contest, Nov. 20th–22nd. 17m activity will also take place from Northwest Territories and Alaska after the contest. *QSL Mgr. KL7JR (CBA).* Web site at *[http://www.eng.mu.edu/~usi].*

Photo C. The "Earth" side of Phase 3D has sprouted many antennas in this pre–vibration-test photo. (W3IWI photo)

Quick Research Test bed) experiment from Stanford University. The first SQUIRT experiment, SAPPHIRE is still waiting for a launch. OPAL stands for Orbiting Picosatellite Automated Launch. OPAL is attached to one side of JAWSAT and carries a number of very small satellites. OPAL's primary mission is to demonstrate the feasibility of launching multiple "picosats" (very small 1-lb. satellites) while carrying a few other integral devices including an accelerometer and magnetometer test bed. Check out the OPAL Web pages at: [http://ssdl.stanford.edu/opal/index.html].

FalconSat is a project that has a lot of similarity to AMSAT microsats, but it's actually an Air Force Academy student project that uses non-ham frequencies. It is also to be included in the JAWSAT configuration.

The big ...

We've been hearing about it for years from AMSAT groups around the world: Phase 3D. Recently there were only two hurdles left for Phase 3D, vibration testing and launch. Vibration testing is complete. Now all we need is a ride to orbit.

In August, Phase 3D went for a ride in a rented truck, from Florida to the Goddard Space Flight Center in Maryland. Before a satellite is sent to orbit, it must be tested to make sure it will survive the rigors of space, and the ride to get there. The satellite has been tested for thermal and vacuum tolerance, but vibration tests were needed to make sure this rather large (over 6 feet in diameter and several hundred pounds) hamsat would still work after a ride on a rocket.

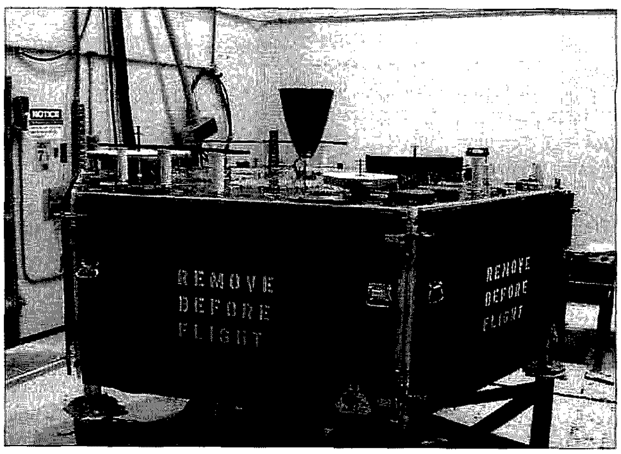

Photo D. Ready for transfer to the vibration-test chamber, Phase 3D is complete. (W3IWI photo)

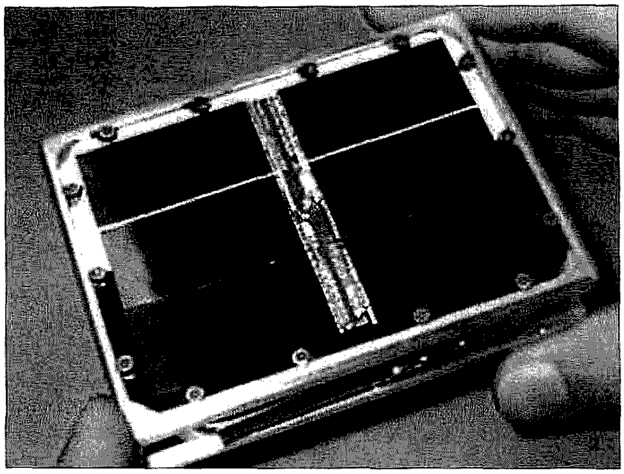

Photo E. StenSAT is a real hamsat with a Mode "J" FM transponder, even though it's only about as big as a wallet. (StenSAT project photo)

Phase 3D was structurally reworked after data was in from the first flight of an Ariane 5 rocket. In addition to a disastrous end, the first Ariane 5 flight was much rougher than expected and the vibration specifications for any prospective future payloads were tightened considerably.

The vibration tests at Goddard mark a significant milestone for the Phase 3D team. For the vibration tests, the satellite needed to be complete. Only the solar array pyrotechnics, used to allow deployment of the panels after arriving on orbit, were left out. Also, the fuel tanks were filled with a mass substitute rather than actual fuel. The results of the vibration tests were excellent. Just add some explosives, UDMH (Unsymmetrical Dimethyl Hydrazine), ammonia and some other good stuff for a big hamsat, and go for that final ride to space. Optimism is high for a launch in the near future. AMSAT President Emeritus Tom Clark W3IWI took some really nice photos of Phase 3D during its stay at Goddard. Some are presented here, and others can be seen at Tom's Web site on the Internet: [http://www.clark.net/pub/tac/p3d.htm].

It's easy to forget some of the incredible modes that Phase 3D can handle. New names for the modes of Phase 3D are a bit less cryptic than Mode "B", "J", and others from the past. Due to the wide range of microwave gear on Phase 3D, there will be some really exotic frequencies on board, but there will be some old favorites, too. An early preferred mode via Phase 3D will be Mode "UV", for UHF (70 cm) up and VHF (two meters) down, like Mode "B" that made its

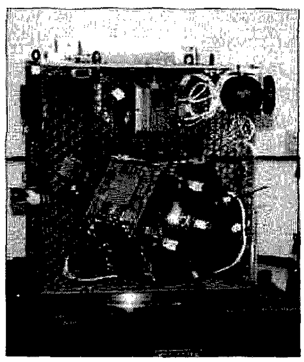

Photo F. StenSAT is a small part of OPAL (Orbiting Picosatellite Automated Launcher). OPAL is shown attached to the MPA (Multi-Payload Adapter), also known as JAWSAT. (Opal project photo)

Number 53 on your Feedback card

ON THE GO

Mobile, Portable and Emergency Operation

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Even more Y2K

The experts say that every idea goes through several stages on its way to acceptance. The first stage is ridicule ("That's dumb and you must be crazy!"). The second is opposition ("We must stop this!"), and the third is acceptance ("Of course! Anybody could have seen how obvious this is!"). I believe we are firmly in the third stage with regard to the Y2K issue. Every day the newspaper has a report on some aspect of it, and the television medium is approaching it in their usual sensational way. The experts have come out of the woodwork to assist us with these problems. I've heard experts from every walk of life making recommendations on how to handle the problems that December 31, 1999, might bring. I've heard computer experts (of course). Navy SEALs (I've learned not to argue their qualifications), and some who seem to have jumped on the bandwagon just because there's a bandwagon on which to jump. Everyone seems to be getting into the act. If nothing else, this once obscure potential problem is now well known.

But as communicators, what have we done differently? We've examined some of the potential problems that might occur as part of Y2K failures. We then have looked at how amateur radio might fit in and what services we might be called upon to provide. We've discussed some of the equipment needs that we might have if available repeaters exhaust backup power. We've also discussed preparation and coordination with the agencies we might be called upon to serve. We've looked at how amateur radio may fit into the overall scheme of disaster support if there should be problems with power and/or communication at the turn of the year. How do these differ from what we would do in other types of disaster support? They really don't. These are the things that we would normally be expected to plan for, the only real difference being that we have a date and a time when we suspect that something might happen. Naturally, it is always easier to plan for something with definite parameters than for something vague and indefinite. At the very least this has been a good exercise in planning. Instead of this being something on our "To Do" list, many hams have gotten this planning on their "Done" list. But don't get too comfortable — all plans have a very, very short life span.

The biggest difference I've seen in the amateur radio community is a heightened sense of creativity. This has included new approaches to problems, as well as new evaluations of existing solutions. I enjoyed Thomas Miller WA8YN's ideas on emergency power in the July issue of *73 Amateur Radio Today*. I never thought of hooking an alternator to a small gasoline engine — yet this looks like a fairly inexpensive way to generate the 13.8 volts we need for most amateur radio equipment. Add a deep-cycle battery and you can keep a mobile rig going at low to medium power for quite some time.

I got a letter from Rick Aiello N2HTT, from New York, who raised a couple of interesting issues. He has an 8000 watt power generator, which he got because he lives in a rural area where power losses often accompany bad weather. Having lived in the snowbelt myself, I know all too well how storms and power outages go together. Lines ice up, become heavy and fall, and the power fails. Icy roads lead to accidents that can involve power poles, and power fails. High winds can bring about the same result as lightning strikes. Because of such eventualities, he has converted his generator to propane, which allows the generator to run for long periods without refueling. Propane is generally acknowledged to be a cleaner alternative to gasoline, and easier on the engine. For those of us who don't live out in the country this is an approach we might not have considered, since we expect power to be quickly restored in the event of an outage. Rural folks often must wait longer, since there are fewer people affected by the failure of a particular power line. He is looking for ideas to clean up the power output. Home generators are great, but since they are designed mainly for lights and appliances, I am not sure that the power would be clean enough

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debut with AMSAT-OSCAR-7 many years ago. Now AMSAT-OSCAR-13 Mode "S" enthusiasts will have new Mode "US" to chase on Phase 3D. It uses UHF up and S-band (2.4 GHz) down. Another favorite that got a tentative test on AMSAT-OSCAR-10 many years ago as Mode "L" is the Phase 3D version called Mode "LU". It has an L-band (1.2 GHz) uplink coupled to a UHF downlink. An exciting combination of Modes LU and US will be Mode "LS", with 1.2 GHz up and 2.4 GHz down. And that's just the beginning! The satellite has C-band, X-band, and K-band systems to provide some real alphabet-soup communications modes. For a complete list of the satellite's capabilities, check the AMSAT Web pages at: [http://www.amsat.org/amsat/sats/phase3d.html]. Also check the AMSAT lab Web site at: [http://www.magicnet.net/~phase3d] for the latest pictures of the satellite.

... And the tiny

Imagine a satellite so small that you could carry it like a wallet, in your back pocket. That's StenSat. This picosat is one of the tiny satellites to be deployed by OPAL, which will be deployed by JAWSAT, as described earlier.

The StenSat crew is a group of radio amateurs from the Washington, D.C., area. After a lot of Internet E-mail and brainstorming, it was agreed to build a satellite that could send packet telemetry at 1200 baud and also be used as a Mode "J" (two meters up and 70 cm down) single channel, FM transponder for voice contacts. With solar cells on the top and bottom, and antennas wrapped around the sides, StenSat looks more like a curious tape case or oddball power supply.

The name StenSat comes from Stenhouse, a large, old house without air conditioning where several team members lived shortly after completing college. Projects from those days included tennis-ball launchers, rail guns, and other curiosities. Now they're building satellites.

The solar panels can't generate enough power for continuous operation, and power output will be less than other satellites', but StenSat could be a very serious addition to the hamsat fleet. Watch for this one, and check their Web page at: [http://users.erols.com/hheidt/intro.htm].

Number 54 on your Feedback card

HOMING IN

Radio Direction Finding

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City of Roses — and foxes

"Amateur Radio history is being made!" I lost count of the number of times those words were used during the second week of August. I said them, the organizers said them, and so did officials of the ARRL and the International Amateur Radio Union (IARU). The historic occasion was the first IARU Region 2 (North and South America) Amateur Radio Direction Finding (ARDF) Championships. Thirty-two world class foxhunters, about half from the USA and the rest from seven other countries, took to the fields and forests to find out who was the best. I'll tell how your countrymen (and women) did, but first a bit of history and background.

On-foot radio direction finding (also called foxtailing, foxteering, radio-orienteering and ARDF) has been an important sport in Europe and Asia for some time. The other two IARU regions have held national and international ARDF championships for twenty years, but it was not until 1996 that a North American (Kevin Kelly N6QAB) competed in one. (See "Homing In" for December 1996.)

Last year, six hams from the USA traveled to Hungary to take part in the ARDF World Championships there. (See "Homing In" for January 1999.) Dale Hunt WB6BYU, the USA's Team Captain for that trip, was told by IARU officials that it was time for the western hemisphere to begin holding its own regional championships, too.

With few exceptions, World ARDF Championships take place in even-numbered years. In between, the three regions are encouraged to hold regional championships. Dale knew that the 1999 Friendship Radiosport Games (FRG-99), to be held in Portland, Oregon, this August, would provide an ideal opportunity for the first such event in this hemisphere.

Photo A. Yevgeny Stavitsky UAØCA streaks up the trail on the 80 meter hunt. He is one of the originators of the Friendship Radiosport Games.

Begun in 1989 by Yevgeny Stavitsky UAØCA (**Photo A**) and others from Khabarovsk, Russia, the FRGs have convened every two years in one of four countries: USA (Portland), Canada (Victoria BC), Japan (near Tokyo) or Russia (Khabarovsk). As documented many times over the last eight years on the pages of *73*, the FRGs have always featured ARDF contests. It was USA's turn to host in 1999. Dale proposed incorporating the IARU Region 2 ARDF Championships into FRG-99, and the rest is history.

Forming the teams

USA and Canada are the only IARU Region 2 countries with ARDF activities at present. As USA's ARDF Coordinator, it was my task to organize Team USA for the championships. You probably read my call for participants in the January and May issues. The "Homing In" Web site and the weekly amateur radio media announced the forming of Team USA early this year. There were special ARDF presentations at the Dayton Hamvention and Sea-Pac.

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for sensitive electronics like computers and some radios. In my experience, sensitive electronics often require significant transient suppression or power conditioning. Since my experience is mainly in high cost medical equipment, tens of thousands of dollars in power conditioning equipment is inexpensive if it saves a million dollars worth of equipment.

Naturally, equipment of this type can be truly life and death impacting, so that is another excellent reason to protect it. For a home generator, it makes little sense to spend as much on power conditioning as a car or even the house itself costs. I suggested a heavy-duty uninterruptible power supply, but I'm sure there are other ideas that might help. Drop me a line or an E-mail if you have an idea or experience with the output of a small generator.

What ideas have you come across during this exercise in preparation? Has your club decided to do something different? Have you made better or different contacts with state or local agencies you might support? Has the ham community in your area been more involved with coordinated planning with disaster or emergency services? How about equipment — have you decided on additional equipment or a different type of gear to use in a future emergency situation? There are some exciting new developments in amateur television that might prove very useful — have you tried any of them? On the other hand, packet seems to have dropped in activity; are there new uses for packet?

Share your ideas before we hit the end of the year. Our planning for Y2K is not going to produce results for only this event. These ideas are ones that will be useful in the next hurricane, blizzard, tornado, or other disaster.

After we get through this, or watch it pass without any significant problems, we can then move on to other areas of the hobby. In these days when new products are ever smaller and have greater capability, the entire hobby may move to mobile and portable operations! Stick around — in any case, it's going to be fun and important. 73

Name	Call	From	Division
Dick Arnett	WB4SUV	Erlanger KY	OTM
Jerry Boyd	WB8WFK	Albuquerque NM	OTM
Bob Cooley	KF6VSE	Pleasanton CA	OTM
Kittee Custer	KB7WRD	Portland OR	OTF
Robert Frey	WA6EZV	Cincinnati OH	OTM
Kuon Hunt	KB7WRG	McMinnville OR	OTF
Marvin Johnston	KE6HTS	Santa Barbara CA	OTM
Harley Leach	KI7XF	Bozeman MT	OTM
Jack Loflin	KC7CGK	McMinnville OR	JRM
Gyuri Nagy	HA3PA	Melrose MA	OTM
Brian Peddicord	KF6DZN	Santa Barbara CA	JRM
Mike Peddicord	KE6OTM	Santa Barbara CA	OTM
Jay Thompson	W6JAY	Santa Ana CA	JRM
Csaba Tiszttarto	(none)	Staten Island NY	SRM
Aaron Wilson	KAØLWY	Beaverton OR	SRM

Table 1. *Final Team USA roster.*

I had no idea how many USA hams would sign up. It was a very pleasant surprise to receive 21 applications before the final deadline. Unfortunately, six had to drop out for personal reasons.

The Portland organizers decided to have separate male and female divisions for Old-Timers (OT, born before 1959), Juniors (JR, born after 1979), and Seniors (SR). Persons born from 1959 and 1979 must be Seniors, but persons of any age may choose to run in that division. Only Seniors are required to search for all five foxes; those in other divisions need search for only four. The omitted fox is different for JRs and OTs.

Table 1 shows the final Team USA roster. Old-timer males were divided into two subteams, based roughly on geography. WB4SUV, WA6EZV, and KI7XF were USA-North. Our other four OTs were USA-South.

My counterpart north of the border is Perry Creighton VE7WWP of Victoria, British Columbia. As ARDF Coordinator for the Radio Amateurs of Canada, he tried hard to recruit ARDFers from elsewhere in his country for this event. As it turned out, all five Team Canada members were from the Victoria area. Each had attended regular two-meter ARDF practice sessions in nearby forests for several years. I knew that they would be hard to beat.

Hams in the City of Roses know how to make visitors feel welcome. Most competitors, including April WA6OPS and I, arrived on the weekend of August 7–8. On Sunday, Rene KX7Z and Ann Berblinger treated us all to a trip to Multnomah Falls, plus the Bonneville Dam and its

Photo B. *The 80 meter finish was downhill, so most runners built up a lot of speed. Here comes Jerry Boyd WB8WFK of Albuquerque, who built his receiver/antenna set just in time for this event. His team (USA-South) won the silver medal.*

Photo C. *Ardee Fox was Team USA's official mascot, courtesy of April Moell WA6OPS. He's holding a typical European 80 meter RDF set.*

***Photo D.** Junko Ariyoshi JM1JKR and Yoshiko Yamagami JQ1LCW represented Japan. They are champions at ARDF in their home country and took Visitor gold and silver on both bands in Portland.*

***Photo F.** They're off! Two competitors in different divisions were started every five minutes, coincident with the beginning of fox #1 transmission. Dick Arnett WB4SUV (USA-North) and 14-year-old Jay Thompson W6JAY are beginning the 80-meter sprint. Both were on teams that won gold medals at this event.*

generating facility. It was a great way to relax and get acquainted with foxhunters that we hadn't met before.

Monday and Tuesday were spent in training and preparation for the foxhunts to follow. It's unusual for two days of a championship event to be devoted to this, but it was a real boon to the Region 2 hunters. It gave them a chance to learn the most effective RDF techniques from willing teachers such as Rik Strobbe ON7YD, Chair of the Region 1 ARDF Working Group, and Panayot Danev LZ1US, ARDF Coordinator for Bulgaria.

Most of the US and Canadian hunters had never experienced ARDF on 80 meters. Jerry Boyd WB8WFK (**Photo B**) was the only North American who had his own receiver/antenna unit for that band. Rik and several other Europeans brought plenty of 80m sets (**Photo C**), so there were plenty to loan out for practice and for the 80m hunt on Thursday.

Region 2 vs. the world

All alarm clocks rang early on Wednesday, so everyone could make the 75-mile trip to Silver Falls State Park east of Salem, site of the two-meter foxhunt. Mist and occasional light rain made running conditions pleasant, except for the inevitable soaked shoes and socks. Fortunately, the finish-line shelter featured a fireplace that became a dry-out area.

As expected, the experienced visitors from Regions 1 and 3 had almost all of the top individual scores. Bengt Evertsson SM4VMU and Bryan Ackerly VK3YNG of Australia took the SRM division. Panayot Danev LZ1US of Bulgaria and Alexandr Kochergin UN7JR of Kazakhstan won OTM. Junko Ariyoshi JM1JKR and Yoshiko Yamagami JQ1LCW of Japan (**Photo D**) were top YLs. The exception was the Junior Male division, where Jack Loflin KC7CGK took first place. He did better than Stanislav Gorbatskiy of Kazakhstan, who had beaten Jack at last year's world championships in Hungary. All Team USA members returned within the time limit, avoiding disqualification. USA's SRM team won over the Canadian SRMs, but the well-practiced Canadian OTMs took the gold,

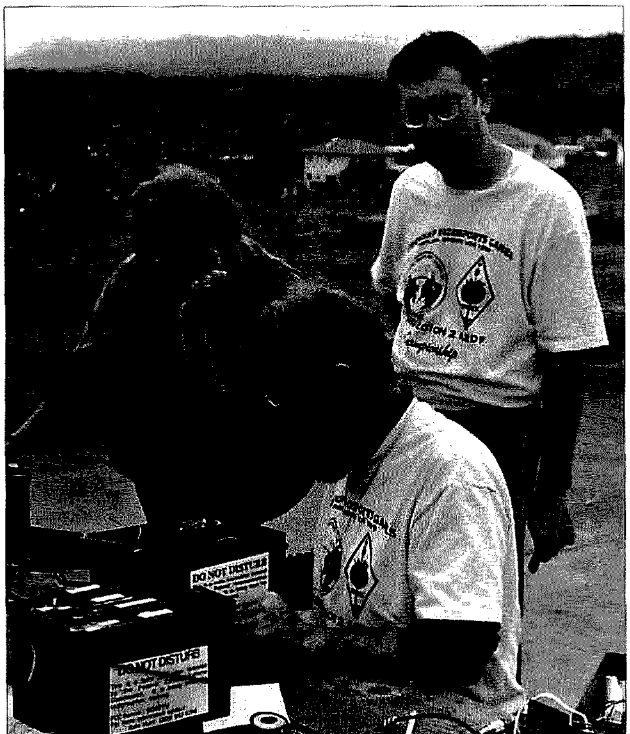

***Photo E.** Dale Hunt WB6BYU, the Foxhunt Organizing Chair, makes last-minute repairs on an 80 meter transmitter, watched by Fay Loflin KC7OML, a Course Marshal, and Rik Strobbe ON7YD, the IARU Region 1 ARDF Working Group Chair.*

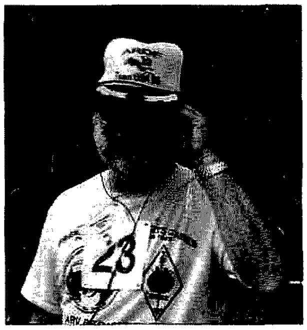

***Photo G.** Marvin Johnston KE6HTS of Santa Barbara, wearing his Team USA cap, seems cool and calm after finishing the 80m run. His team (USA-South) took the silver medal.*

beating both USA-South (silver medal) and USA-North (bronze medal).

Could the Old-Timers of Team USA make a comeback in the 80m test on Thursday? Weather was much warmer and the site (Powell Butte Nature Park) was much closer. After some technical problems with the transmitter were resolved (**Photo E**), the contestants were off again.

In the SRM division, Gyuri Nagy HA3PA/KF6YKN streaked to the finish line in less than 36 minutes, beating second place SM4VMU by 8 minutes. Gyuri, who has resident status in the USA, had just received his USA callsign after taking the test a week before. Harley Leach KI7XF (age 57) took third place in the OTM division in an impressive 68 minutes. This time, USA-North (**Photo F**) took OTM Region 2 team gold and USA-South (**Photo G**) took silver.

After it was over and scores were tallied, everyone enjoyed a barbecue. Individual and team awards for both bands were presented by IARU Region 2 President Tom Atkins VE3CDM (**Photo H**). Each Team USA member earned at least one of the beautiful medals provided by Motorola. More importantly, each competitor took home many memories, lasting friendships, useful experience, and eagerness to tell everyone about the joys of ARDF.

Your town next?

Congratulations to the hams of FARS, and special thanks to Dale WB6BYU and Kuon KB7WRG Hunt. They took charge and turned the dream of this first-ever championship event into a reality. There's lots more to be said about it. I could go on about the excellent facilities at Reed College and the joys of setting out foxes just in the nick of time. But that will have to wait for another opportunity. Meanwhile, check the "Homing In" Web site for the complete individual and team scores, plus over 40 photos of this historic week.

You can be sure that all of the attendees are eager to share their experiences, too. If you live near one, invite him or her to talk at your local radio club. If ARDF sounds like fun for your ham club, school, or Scout group, get the ball rolling by putting on some RDF demonstrations and simple practice hunts, to get them hooked. Make on-foot ARDF a part of your club's hamfests, picnics, T-hunts, and other activities. Invite other clubs in the vicinity to participate, too. Make sure that your ARRL section and division leaders know of your efforts, as this will help them to understand the need for more League support of this sport.

Photo H. IARU Region 2 President Tom Atkins VE3CDM (right) presented the medals. Kuon Hunt KB7WRG took Region 2 gold in her division on both bands.

By spreading the word about this exciting aspect of ham radio, you can help to make it a nationwide and hemispherewide activity. Talk up ARDF on the air, to your stateside and DX contacts. There are many other countries in IARU Region 2 that could and should be doing this sport.

Let the rest of us know what you are doing. Send ARDF news to me for this column, and make sure it gets posted to the Internet foxhunting mailing lists. Information on these lists, plus much more on all aspects of RDF, is at the "Homing In" Web site.

LETTERS

continued from page 8

parts A, B, C, or D, and also E, they cannot be classified as a person "doing business" with them. Requiring an SSN without meeting this condition violates the Privacy Act of 1974.

Further, note that under (3), even where it would be proper for the FCC to require an SSN, the FCC is not permitted to use the SSN as a unique database identifier, as it now does, but only in the collection and reporting of delinquent FCC administered debt.

(3) Each agency shall disclose to a person required to furnish a taxpayer identifying number under this subsection its intent to use such number for purposes of collecting and reporting on any delinquent amounts arising out of such person's relationship with the Government.

The FCC's use of the SSN/TIN as a database identifier also violates the Privacy Act of 1974.

Most amateur licensees, as well as the ARRL and their law firm, have overlooked these legal requirements. But they are important, as the Privacy Act is made completely ineffective without them. Any federal agency charging a fee, such as the Postal Service does for stamps, could similarly demand a SSN if they too misapplied the Debt Act, as does the FCC, clearly not the intent of Congress.

One final point that strongly indicates that the FCC is only interested in sneaking the SSN grab through is how they ignore their own incorrect interpretation of the Debt Act. They ride

NEVER SAY DIE
continued from page 30

pleading that the bomb be demonstrated to the Japanese where it wouldn't kill people. General Groves made sure the petition never reached Truman, so he's the guy to be blamed for that unnecessary carnage. If we'd dropped Little Boy on a small Japanese island the message would have been loud and clear without destroying two cities and hundreds of thousands of people.

The book also discusses the dumping of radioactive waste into rivers and lakes, the carelessness with employee exposure to radiation, and so on. It's a grim reminder that we just can't trust our government.

It's an interesting book.

Sweet Deal

Maybe you missed the little item in a news magazine showing that members of the House Banking Committee got an average of $33,000 from commercial bank PACs vs. $500 average for House members not on the committee. The Banking Committee members got an average of $20,000 more from securities firms and insurance company PACs. One thing we know for sure — none of the legislation these PACs bought is going to benefit us. We're just the dumb suckers who keep giving these crooks their ticket to ride the gravy train.

Serendipity

Sherry has been after me to let you know about the *Better Generation* CD and cassette I made for Marty Balin—recorded in my studio. Remember the Jefferson Airplane and Jefferson Starship? Well, that was Marty Balin and his group. Marty needed a CD of his new songs to sell on his group's next tour, and he'd been so badly screwed by the major labels that he came to me. Marty claims he's made more royalties from this release than from anything his group had done in the past.

Anyway, just as I was getting Marty's CD and cassette ready to promote, a letter came in from Ian Zukswert of Broadalbin, NY. "I'm writing to let you know how much I enjoyed the CD *Better Generation* by Marty Balin. I happened on it at a record store in Albany. It's great to hear some super music by the extremely talented Marty Balin once again. He's a legend with one heck of a career and I appreciate your making it possible to hear some of his current tunes."

If you're into the "Jefferson" sound, you'll enjoy Marty's latest release. If you're interested, I'll make the CD or the cassette of *Better Generation* available for you for $5. While they last. Add it to your order on page 63.

Worse

As I sat one day, discouraged over how bad some things had gone, a voice came to me from the gloom saying, "Cheer up! Things could be worse." So, I cheered up, and sure enough, things got worse!

Strong-Arm Tactics

Oh, dowsing skeptic, you who haven't bothered to read any books on the subject, or to try even the simplest of dowsing techniques for yourself, I have a little test for you. A letter from an Art Bell listener triggered this.

Quite a while ago I reviewed the marvelous book *Vibrations*, by Owen Lehto. It's available from the Acres USA Bookstore, or direct from the author for $20 postpaid. See my *Secret Guide to Wisdom* for his address. Owen shows how anyone can test whether something is good for them to eat or not just by holding the item in the left hand (if they're right-handed) and letting the right arm hang down at the side. If the right arm makes small clockwise circles that's positive. It's okay. If it goes counterclockwise, it's no good for you.

I read the book, tried his system, and it immediately worked for me. So I went to the office and asked several of the people there to hold an apple in their left hand and let their right arm hang loose. I didn't tell them what was supposed to happen. You got it right, their arms made small clockwise circles. Then I put a piece of candy in their left hand and watched their right arm make counterclockwise circles. It worked for everyone!

Another approach is to hold the right arm out and have someone push down on it. The bad stuff makes the arm weak and easily pushed down. Good stuff makes it almost impossible to push down.

My correspondent used this technique to test for EMF effects from pole transformers. He found that arms began to lose strength at about 0.1 milligauss! The accepted radiation level has been 1.0 mg, with power companies accepting anything under 10 mg.

What I'd like to know is what effect our ham rigs are having on us. How about doing the arm test at different points in and out of your house to see what your body's milligauss meters says? Test first with the rig off to see what EMF field effects are there. Then turn on the rig and see what changes that makes. Let me know, okay?

You can also test for the effects of underground streams that may run under your home and be causing long-term health problems. You can read more about this in the dowsing books. And if your skepticism is at full force, know you that these underground stream effects have been measured with scientific instruments.

Told You So

With our fortieth anniversary coming up next year, we

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the high horse of being a good federal agency helping to recover 100 billion dollars in bad loans by implementing what they claim to be a Congressional mandate to get SSNs of its licensees. But, part B says that recipients of a Federal license meet the requirements of B.

(B) An applicant for, or recipient of, a Federal license, permit, right-of-way, grant, or benefit payment administered by the agency or insurance administered by the agency. If the FCC's interpretation of the Debt Act is correct to their way of thinking, then they have to get the SSN of ALL their licensees, not just those applying renewing, or modifying them as they now are. They are, by their own interpretation, required to suspend or revoke the licenses of those persons already "doing business" with them not registering. Why don't they do this? What about all the FCC loans hams (I'd bet there are not any hams that have FCC loans) are about to default on before they renew their licenses?

Both *QST* and *CQ* act as if they are in complicity with the FCC in seeing that they pull off the illegal SSN grab. I'd hate to think that was the case, but the way Frederick Maia refers to hams who don't sheepishly acquiesce as "stubborn," and David Sumner's grasping at straws to bolster the scheme, suggests as much. I've written W5YI twice, but he has not acknowledged my letters. I get the feeling from Mr. Sumner that even though it's illegal for the FCC to demand SSNs, it's past the public comment period, ULS has come too far, and too many at the FCC are actively working on ULS to even question it anymore.

If those who want the FCC to follow the rules governing them the same as we have to follow FCC rules over us are stubborn, count me in. I'm proud to be one of them. This isn't about ham radio or even the SSN; it's about the rule of law and whether this country really has one, or if we have runaway bureaucracies exercising powers not granted them.

thought it might be interesting to take a look back at some of my columns from the days of yesteryear. Yeah, I know I put sugar in the applesauce recipe, but I've learned a lot since then. Have *you?*

35 Years Ago in *73* ...

Do It Yourself?

In all of the tumult over incentive licensing, there is one item that seems to be generally accepted: It would be nice if things were better. We all wish that operating in our lower bands wasn't quite so hectic, that more operators would be considerate, that more public service was being accomplished, that more of us would try building equipment and that we would all continue to improve technically. Not necessarily in that order.

All of these goals are worth tackling. Amateur radio will be the better for their success and our enjoyment of it will be just that much more enhanced.

The question is, shall we go after these objectives voluntarily, putting our own personal enthusiasm into them, shall we do it with a gun stuck in our back, or shall we just leave everything alone and let things fester?

My own belief is that we can accomplish all this ourselves without the FCC wielding a big stick.

Ham radio is one of the greatest hobbies in the world. Not only do we get entertainment from the use of it, but we are ready to help out in any emergency or disaster. Perhaps it is time that every one of us took a good deep look into ourselves to see what we can do to be a better amateur and to make amateur radio better. This means all of us, from the oldest old-timer to the newest Novice. All of us can help ourselves and ham radio.

What can *we* do? Let's take another look at those goals:

Courtesy
Wider use of available bands
Technical improvement
Home construction
Public service

Courtesy. Perhaps consideration would be a better term. All of us can devote time and effort to this, not only in being sure that our own behavior is impeccable, but in teaching others what is right and what is wrong on our bands. It takes great courage to speak up when someone has done wrong ... and great diplomacy. Diplomacy is not a born ability, it is learned through bitter experience. I find that few fellows get angry when I suggest an improvement in their equipment or techniques. I believe that the single greatest improvement to ham radio would be universal consideration.

Bands. To all practical purposes there is no QRM on the six and two meter bands. Neither is there any lack of activity. If you'll give them a try you'll find quite a few refugees from the furies of 20-40-80 up there. Ten needs you too.

Though all of these goals can be reached on a personal basis, many of them can be more effectively implemented through the group effort of an amateur radio club. Group action is the backbone of our hobby. Very few amateurs live beyond driving distance of a ham club. If every amateur would make it his business to attend club meetings and encourage his club to achieve the above goals we would enter a new era in our hobby.

Club discussions of operating practices are certain to be lively.

A club channel on ten, six, or two would certainly open new horizons for many of the members stranded in the jungles on 75 or 20. Group efforts might even get activity going on 432 mc, which is increasing in popularity rapidly these days.

Every club meeting should include a short *technical session* where some phase of radio is discussed. The technical topic can be assigned at the previous meeting and should be something that all members can bone up on ... perhaps a technical article in *QST* or *73*. Clubs that are interested in using any of the many such technical articles published in *73* can buy bulk copies of back issues at our cost plus postage. That's the least we can do. *Club projects* for building identical units is fun and profitable. The club can take advantage of bulk buying savings ... individual members can be sure that there will be someone to help them out of self inflicted difficulties. Turn to the back issues and handbooks, fellows. Construction is considered by many as one of the most exciting aspects of amateur radio. How about giving it a try?

Public service is easy. Club members should be able to come up with more suggestions than you can ever tackle. And don't forget to toot your horn when you turn in a good job ... write an article for the local paper.

Tithe

Your excuse is the same as mine. I just don't have time. What little time I have to spare I like to use to get on the air. This is just an excuse, a rationalization. Actually there are darned few of us that cannot spare one night a month to attend a club meeting ... and fewer yet that cannot spare a half hour or so a week to do some building and technical reading. If a fellow isn't interested enough in improving ham radio so that he is willing to invest one tenth of his hobby time in our common goals, how valuable an asset is he to the rest of us ... or to his country ... or to himself?

Please give some serious consideration to devoting a tithe of your time to bettering yourself and amateur radio.

30 Years Ago in *73* ...

...Wealth?

A few months back there was a snide reference in one of the other ham magazines to a little booklet I wrote a couple years or so back on *How To Make a $1,000,000.* I've mentioned this briefly in my editorials before, I realize, explaining that my interest in the matter is more academic than real.

This academic interest does lead me to read most of the books that come out on the subject of making money or keeping it, once you've made it. And that can be a problem too. In addition to the book by Lloyd Colvin W6KG on making a million in the home construction business, I might also recommend the pocket books on *The Rich and The Super Rich,* and *Atlas Shrugged.* The first of these was particularly interesting to me because it backed up my own deduction that college education not only does not help you to make big money, it in fact is a severe hindrance.

Fortunately for our school system, very few people seem to be even slightly interested in going for the big money. By big money I mean enough to permit you to retire and live comfortably from the invested capital, not millions of dollars.

Fortunes are not being *made* any more, just inherited. However, thanks to inflation, it is not at all difficult to gather together one little bitty million. This is being done quite frequently by those either shrewd enough to figure out the system or those lucky enough to fall into it. I suppose I should add a third group that ignore the system and get there by stealing.

Even considering Parkinson's Second Law (expenses will always rise to meet income), $1 million invested at a mere 5% should last you rather well. You won't be a big yacht customer or buy a Rolls, but at $50,000 per year, the wife shouldn't have to buy cloth coats for winter.

Naturally I recognize that the preponderance of *73's* readers are inescapably committed to their present life and that any discussion of a career is, for them, quite academic. On the other hand, few of us are not occasionally

Continued on page 61

Number 60 on your Feedback card

PROPAGATION

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October

October does not begin well for DX signal propagation on the HF bands. As you can see from the calendar, propagation is expected to be Poor or Very Poor from the 1st through the 9th. A disturbed magnetic field and very upset ionosphere is likely to prevail during that period, and you may expect some other very pronounced geophysical effects on the 7th, 8th, and 9th.

"Conditions" should improve with chances for good DX propagation during the week between the 11th and 18th. However, strong geophysical disturbances will probably return with magnetic field upsets and an active ionosphere for the week between the 20th and 27th. A slight improvement and much better DX propagation is anticipated for the last three days of the month.

Your best opportunities for logging new and possibly rare countries will occur between the 12th and 17th and again on the 30th and 31st. Good luck and patience for the other days.

November

November will exhibit variable DX conditions on the HF bands, ranging from Poor to Good, as shown on the calendar. The days 1st–5th and 18th–22nd are expected to provide GOOD DX paths to most areas of the world, but signals may not be quite as strong as during the best days of September or October, due to the reduced E- and F-layer ionization at the onset of winter in the northern hemisphere.

POOR conditions for DX are expected on the 7th and 8th and again on the 25th and 26th, with the remaining days of the month trending between the extremes.

Those with good ears and good receivers will make the best of the FAIR conditions between the 10th–12th; the 15th and 16th; and again from the 28th–30th.

Atmospheric storms and other geophysical disturbances are also likely during the 7th and 8th and again on the 25th and 26th.

Happy Thanksgiving!

Band-by-band forecast

10–12 meters

Expect morning F2 path openings to Europe and Africa; on (G) days, midday path openings to South and Central America, and F2 path openings to Japan, Australasia, and the Pacific during the afternoon at your location. DX moves west as the day progresses.

15–17 meters

Expect good DX paths to most areas of the world, with excellent openings from the northern hemisphere to Africa, South America, and the Pacific during hours of daylight and peaking during local afternoon. Good short-skip communication over 1000 miles will occur on (G) days.

20 meters

Very good DX openings to all areas of the world from sunrise through the early darkness hours. The signals will peak an hour or two after sunrise at your location, and again during the afternoon. Short skip beyond about 700 miles will occur during daytime hours.

October 1999

SUN	MON	TUE	WED	THU	FRI	SAT
					1 VP-P	2 P
3 P-F	4 F-P	5 P	6 P	7 P-VP	8 VP	9 VP-P
10 P-F	11 F-G	12 G	13 G	14 G	15 G	16 G
17 G	18 G-F	19 F-P	20 P-VP	21 VP	22 VP-P	23 P
24 P-VP	25 VP	26 VP-P	27 P	28 P-F	29 F-G	30 G
31 G						

30–40 meters

Good worldwide DX openings from sunset to sunrise should occur on (G) days. Noise levels (static) will be higher if thunderstorms occur, and can depress audibility. Short skip between 100 and 1000 miles will occur during daylight hours, and at distances beyond 1000 miles at night.

80–160 meters

On 80, DX to the southern hemisphere and to Europe should occur after dark and during sunrise hours — limited, of course, by static noise levels. Daytime short skip to about 350 miles, and beyond 500 miles after dark, will prevail on (G) days. On 160, no daytime propagation will occur due to

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	15/17	20/30	-	-	-	-	20/30	20/30	-	-	-	15/17
ARGENTINA	20/30	20/30	40	40	-	-	-	-	-	10/12	10/12	15/17
AUSTRALIA	15/17	-	20/30	-	-	40	20/30	20/30	-	-	-	15/17
CANAL ZONE	15/17	20/30	40*	40*	40	-	20/30	20/30	20/30	10/12	10/12	15/17
ENGLAND	40	40	40*	40	-	-	20/30	15/17	10/12	10/12	20/30	20/30
HAWAII	15/17	20/30	20/30	40	40	40	20/30	20/30	-	-	10/12	10/12
INDIA	-	-	-	-	-	-	20/30	20/30	-	-	-	-
JAPAN	15/17	20/30	-	-	-	-	20/30	20/30	-	-	-	15/17
MEXICO	15/17	20/30	40*	40*	40	-	20/30	20/30	20/30	10/12	10/12	15/17
PHILIPPINES	-	-	-	-	-	-	20/30	20/30	-	-	-	-
PUERTO RICO	15/17	20/30	40*	40*	40	-	20/30	20/30	20/30	10/12	10/12	15/17
RUSSIA (C.I.S.)	40	40	-	-	-	-	-	15/17	15/17	20/30	-	-
SOUTH AFRICA	20/30	-	-	-	-	-	-	-	15/17	15/17	10/12	20/30
WEST COAST	40	80	-	-	-	-	-	20/30	20/30	20/30	15/17	40

CENTRAL UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	15/17	-	-	-	-	-	-	-	-	-	-	15/17
ARGENTINA	15/17	20/30	20/30	40	40	-	-	-	-	-	10/12	15/17
AUSTRALIA	15/17	20/30	20/30	20/30	-	40	80	-	-	-	-	15/17
CANAL ZONE	15/17	20/30	20/30	40*	40*	-	-	15/17	15/17	10/12	10/12	15/17
ENGLAND	-	40/80	40/80	-	-	15/20	15/17	15/17	20/30	20/30	20/30	-
HAWAII	15/17	20/30	20/30	40	40	40*	80	20/30	-	-	10/12	15/17
INDIA	-	-	-	-	-	-	-	20/30	-	-	-	-
JAPAN	15/17	-	-	-	-	-	-	-	-	-	-	15/17
MEXICO	15/17	20/30	20/30	40*	40*	-	-	15/17	15/17	10/12	10/12	15/17
PHILIPPINES	15/17	20/30	-	-	-	-	-	20/30	-	-	-	-
PUERTO RICO	15/17	20/30	20/30	40*	40*	-	-	15/17	15/17	10/12	10/12	15/17
RUSSIA (C.I.S.)	-	-	-	-	-	-	-	20/30	15/17	20/30	-	-
SOUTH AFRICA	20/30	-	-	-	-	-	-	-	-	15/17	15/17	20/30

WESTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	10/15	15/17	15/17	20/30	20/30	20/30	40	40	-	-	-	15/17
ARGENTINA	10/15	20/30	20/30	40-	-	-	-	-	-	-	15/17	10/15
AUSTRALIA	10/12	15/17	15/17	20/30	20/30	40-	40	40-	20/30	20/30	15/20	15/17
CANAL ZONE	20/30	20/30	40/20	40/20	40	-	-	20/30	15/17	15/17	10/12	10/12
ENGLAND	-	-	-	-	-	-	-	-	-	15/20	15/20	-
HAWAII	10/12	15/17	20/15	40	40*	40*	40	40	-	20/30	20/30	20/30
INDIA	15/20	15/20	-	-	-	-	-	-	20-	-	-	-
JAPAN	10/15	15/17	15/17	20/30	20/30	20/30	40-	40-	-	-	-	15/17
MEXICO	20/30	20/30	40/20	40/20	40	-	-	20/30	15/17	15/17	10/12	10/12
PHILIPPINES	15/20	15/20	-	20/30	-	40-	40-	-	20/30	20/30	-	15/17
PUERTO RICO	20/30	20/30	40/20	40/20	40	-	-	20/30	15/17	15/17	10/12	10/12
RUSSIA (C.I.S.)	-	-	-	-	-	-	-	-	20/30	-	-	-
SOUTH AFRICA	20/30	20/30	-	-	-	-	-	-	-	15/17	15/17	20/15
EAST COAST	40	80	-	-	-	-	-	20/30	20/30	20/30	15/17	40

NEVER SAY DIE

continued from page 59

put in the position of being able to influence a younger person, so perhaps a bit of thinking about careers and the future is not entirely out of line.

It is all too easy to try to pass along the values that we have been taught. I accepted without hesitation the idea that everyone that could should go through college. It never even occurred to me to question this. I think I have the matter in better perspective now.

A college education, complete with Master's degree, is worth every dollar and day to the fellow who wants to work for a large company for the rest of his life. The pay is good and the life is American Standard. Of course it means buying most of the big things on time payments for many, many years. The house will never be paid for, since advancement in business means moving into a bigger house every few years with attendant refinancing. Add car payments, boat payments, vacation payments, etc.

That little postcard from Cleveland Institute that we bind into *73* every now and then got me to thinking. I detest those darned things, but as a publisher I have to recognize the economics of my business and run them now and then. At any rate, I sent in one to Cleveland and in a few days one of their nice four color brochures arrived. The cover letter asked me, "Where do you want to be in life in one year ... in two years ... in three years from now?

My own plans are formulated, but I wonder how many of the younger amateurs have done much thinking about their future?

How long do you think it will really be until we have space stations parked in our skies making wires across the Earth a thing of the past? Telephones in the shirt pocket. FM radio and TV from space. Instant accounting down to the smallest store in the country. Letters and photo copies anywhere instantly. — Wayne Green W2NSD/1, in 1969

There are, obviously, many fortunes to be made in electronics. It is one of the fastest growing fields in the world today. This means opportunity. The big corporations will get bigger, naturally, but thousands of little companies will blossom out and make small fortunes for their entrepreneurs. The little booklet that I wrote on making a million dollars explains a very simple method of taking advantage of this growth, starting out with nothing and getting over the hump in a very few years.

One does not become a successful businessman by starting his own business any more than a concert pianist succeeds by going on stage with no experience whatever. Success requires a lot of hard work and luck. And the harder you work the luckier you get.

Something else has changed with the generations, too, I suspect. It may be my own special background, but in my youth it was not looked down on as a goal to work for wealth. Now, when talking with teenagers, I frequently find that they have no desire at all to make money. This may be apathy or it may be a reaction to parents that idolized money. It is frustrating, though, to have what seems to me to be a really simple way to almost unfailingly make a fortune and find that no one is listening.

How long do you think it will really be until we have space stations parked in our skies making wires across the Earth a thing of the past? Telephones in the shirt pocket. FM radio and TV from space. Instant accounting down to the smallest store in the country. Letters and photo copies anywhere instantly. The hardware and software for this boom will be manufactured by new companies, and hams will plan an important part. The youngsters that recognize this now and get ready for it will be the winners. Ham radio is an excellent start. And courses such as advertised by Cleveland Institute can't but help.

It might be inspirational for the younger members of your radio club if you invited some of the older members who have used their background in ham radio and parlayed it into success to give a talk. If you don't have any real success stories in your club, look around your local area and you'll find them.

Much of the hard work they will tell you about, and which is a key ingredient of their success, is education. It may not be in college, but it could be self-education, reading, mail study courses, and brain-picking every expert you can corner.

Before you sit down to write a heated letter hating me for discussing such outrageous ideas, please take some time and marshal your facts. I will bow to documentation and facts, not to steam and emotion based upon disturbed beliefs. As always, I will most enthusiastically publish further thoughts along this line, pro or con.

Reactionaries

The next time you run into someone on the air or at a club meeting that gets mad when you try and discuss methods of improving the ARRL, just remember that reaction is a very normal human condition. The human body tends to reject the transplant of foreign tissue on it. This certainly is rather parallel to the way in which any mind tends to reject any idea which seems unfamiliar or which threatens an existing system. The intrusive forces are sloughed off or ignored, just as an aging lion tamer resists the decision of a circus manager to buy more lions, or just as an executive tends

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ionospheric absorption of signals, but after dark, peaking around midnight and again during the predawn hours, you should be able to work many areas of the world. Short skip from 1000–2000 miles or so will prevail during the nighttime hours ... but, as always, it will be limited by high static levels from thunderstorm activity.

Don't forget to work the *darkness path* (±30 minutes around local sunset).

Check the bands above and below the suggested ones for possible DX surprises. It's often a good idea to park your receiver on a seemingly unused frequency and just wait. A DX station is very likely to pop up before any one else hears him, and you can snag a good catch.

Please note that the Band-Time-Country chart is the same for both October and November. (*) indicates a possible 80 meter opening, and (-) indicates a difficult path. Good hunting! W1XU/7.

November 1999

SUN	MON	TUE	WED	THU	FRI	SAT
	1 G	2 G	3 G	4 G	5 G-F	6 F-P
7 P	8 P	9 P-F	10 F	11 F	12 F	13 F-P
14 P-F	15 F	16 F	17 F-G	18 G	19 G	20 G
21 G	22 G	23 G-F	24 F-P	25 P	26 P	27 P-F
28 F	29 F	30 F				

to resist the decision to computerize a business, forcing him to grow into new skills.

Ideas must be presented slowly and cautiously, always equating them to previously understood concepts, if they are to be accepted. It is all too easy to leap into a conversation, as I frequently do, presenting the solutions to problems rather than the groundwork for understanding the problems, which will in turn lead to the obviousness of the solutions. Don't do as I do, do as I say.

20 Years Ago in *73* ...

Donate

The question of ARRL finances seems to get murkier all the time. We see letters crying for donations and we read about the horrible losses they are sustaining with their staff, with few old-timers left and empty offices everywhere ... offices which were just recently built at enormous expense.

The donations for their WARC efforts are particularly difficult to justify. Noel Eaton testified before the manufacturers that they have over $600,000 available, if they wish to spend it. In addition to that rather tidy sum, I see by the latest Annual Report that they still have kept up their $100,000 fund for the defense of amateur frequencies ... and WARC would seem to qualify in this department.

Now, it is entirely possible that the League is intending to spend more than $750,000 at Geneva this year. If their performance at the last WARC in 1959 is any criterion, where League officials were flown over at League expense, even with their salaries being paid by the League, and for no more important function than to attend some lavish parties, then they might indeed run through the three-quarters of a million.

Will the League again have a lavish suite of rooms in one of the most expensive hotels in Geneva, all paid for by some 80,000 generous League members? The concept of Yankee thrift seems not to extend down to Connecticut. If you are sucker enough to eagerly send in your hard-earned money for these turkeys to enjoy themselves at your expense, so be it.

While on the one hand I keep hearing the moans of poverty from Newington, on the other I look at their recent balance sheet and find that their net worth increased last year by almost 10%. Most firms would count that as a profit, but the League, being "non-profit," shuffles the bookkeeping around and puts the funds into stocks and bonds (they have over $1.5 million sitting in securities).

The election of directors is coming up this fall and half of the directors are up for reelection. If you blindly return these chaps to office, then *you* must share in the responsibility for what is happening. With the exception of Don Miller, you have nothing to lose by turning the lot of them out. Darned few are active hams anyway ... they are politicians and they're using your money for gratifying their egos. With some new directors, you might have a chance of getting the entrenched clique kicked out of HQ and getting someone with business experience into the job.

I think every amateur really wants to be able to be proud of the ARRL and see it regain its leadership position. But we can't respect it when we see the double-talk and cover-ups ... and when we see everyone we've known at HQ for years getting the hell out ... except for Balwin and Dannals.

It is the responsibility of the directors to see that they have an HQ staff which will run the organization in the black. It is the responsibility of the members to see that they vote in directors who will run the organization and not be buffaloed by a couple of people at HQ. In the meanwhile, sending more money to the League will just encourage them to waste more ... like the government.

The League can make money so they will be able to do the jobs we expect them to ... such as get amateur radio established on a good footing in most of the Third World countries ... and put up a more intelligent battle against FCC rules which are harmful. To do this, they need someone running the place with some business background and, as far as I can see, they don't have it.

The ads in *QST* should bring in about $3 million per year ... and so should the memberships. Books should bring in another $1.5 million per year ... at least. With expenses around $5 million, that should leave a good supply of money for ARRL activities and lobbying.

Instructions for Making Superb Applesauce

First, cut up apples, removing the cores and any blemishes ... spots, bruises ... but leave on the skins. Cut apples into bite-size chunks.

Put in a large pot, perhaps four to eight quarts at a time, fill one-third to two-thirds full with water (depending on your consistency preference), cover, and bring to a boil. Boil about five minutes at most, and stir the apples now and then to make sure all are cooked about the same amount.

When the apples are fairly soft, turn off the heat and add about 1/2 cup of sugar for each quart of apples. This will vary some depending on the tartness of the apples. It is difficult to get an apple which is too tart for applesauce.... I've never found one. Stir in the sugar well and let it cool just a bit.

Spoon the 'sauce into plastic freezer containers, make with the type of apple and the date, and let them cool. Later you can freeze them with no loss of flavor.

I prefer Transparent apples by far, with the second choice being Duchess ... then Wealthy. Macintosh and McCoun are okay, but not nearly as great as the first. I had to plant my own trees just to get the type of applesauce I like.

Milder apples may need some lemon juice to add tart ... use it sparingly and taste as you go. Truly tame apples may even need some cinnamon.

This process of making applesauce is so infinitely better than anything available canned that you will never go back to store applesauce again. Even old, soft apples of the most bland type will make better 'sauce than the best canned stuff.

I often keep a lot of apples in the refrigerator so that I can cut up one or two to have for lunch with some Havarti or Jarlsberg cheese. Eventually these apples get a bit withered and soft ... so I then 'sauce them ... you can cut up a remarkable lot of apples while watching TV and not waste your time so totally. I save some videocassette movies for this process.

If you prefer canning yourself, this works fine, too. I like freezing because it is a lot simpler for applesauce and even for jams, too.

Hey, don't strain the 'sauce. The peels of the apples soften up when you cook them and have some of the best flavor. Some peels will give the 'sauce a nice red color.

You have to have your own tree for Transparent or Duchess, both very early apples. They don't last but a day or two when they ripen, so they are not useful for selling. When your Transparents start to get ripe, start shaking the tree every day and don't let 'em ripen all the way on the tree. My first apples this year were ready to eat in mid-July, which is incredible for New Hampshire. I think the Transparent and the Duchess are the finest apples in the world.

Wise Up!

Here are some of my books which can change your life (if you'll let 'em). If the idea of being healthy, wealthy and wise interests you, start reading. Yes, you can be all that, but only when you know the secrets which I've spent a lifetime uncovering.

......Wayne

The Bioelectrifier Handbook: This explains how to build or buy ($155) a little electrical gadget that can help clean the blood of any virus, microbe, parasite, fungus or yeast. The process was discovered by scientists at the Albert Einstein College of Medicine, quickly patented, and hushed up. It's curing AIDS, hepatitis C, and a bunch of other serious illnesses. The circuit can be built for under $20 from the instructions in the book. $10 (01)
The Secret Guide to Wisdom: This is a review of around a hundred books that will help you change your life. No, I don't sell these books. They're on a wide range of subjects and will help to make you a very interesting person. Wait'll you see some of the gems you've missed reading. $5 (02)
The Secret Guide to Wealth: Just as with health, you'll find that you have been brainwashed by "the system" into a pattern of life that will keep you from ever making much money and having the freedom to travel and do what you want. I explain how anyone can get a dream job with no college, no résumé, and even without any experience. I explain how you can get someone to happily pay you to learn what you need to know to start your own business. $5 (03)
The Secret Guide to Health: Yes, there really is a secret to regaining your health and adding 30 to 60 years of healthy living to your life. The answer is simple, but it means making some difficult lifestyle changes. Will you be skiing the slopes of Aspen with me when you're 90 or doddering around a nursing home? Or pushing up daisies? No, I'm not selling any health products. $5 (04)
My WWII Submarine Adventures: Yes, I spent from 1943-1945 on a submarine, right in the middle of the war with Japan. We almost got sunk several times, and twice I was in the right place at the right time to save the boat. What's it really like to be depth charged? And what's the daily life aboard a submarine like? How about the Amelia Earhart inside story?If you're near Mobile, please visit the Drum. $5 (10)
Travel Diaries: You can travel amazingly inexpensively – once you know the ropes.Enjoy Sherry and my budget visits to Europe, Russia, and a bunch of other interesting places. How about a first class flight to Munich, a rented Audi, driving to visit Vienna, Krakow in Poland (and the famous salt mines), Prague, back to Munich, and the first class flight home for two, all for under $1,000. Yes, when you know how you can travel inexpensively, and still stay in first class hotels. $5 (11)
Wayne's Caribbean Adventures: More budget travel stories - where I visit the hams and scuba dive most of the islands of the Caribbean. Like the special Liat fare which allowed us to visit 11 countries in 21 days, with me diving all but one of the islands, Guadeloupe, where the hams kept me too busy with parties. $5 (12)
Cold Fusion Overview: This is both a brief history of cold fusion, which I predict will be one of the largest industries in the world in the 21st century, plus a simple explanation of how and why it works. This new field is going to generate a whole new bunch of billionaires, just as the personal computer industry did. $5 (20)
Cold Fusion Journal: They laughed when I predicted the PC industry growth in 1975. PCs are now the third largest industry in the world. The cold fusion ground floor is still wide open, but then that might mean giving up watching ball games. Sample: $10 (22).
Julian Schwinger: A Nobel lauriate's talk about cold fusion— confirming its validity. $2 (24)
Improving State Government: Here are 24 ways that state governments can cut expenses enormously, while providing far better service. I explain how any government bureau or department can be gotten to cut it's expenses by at least 50% in three years and do it cooperatively and enthusiastically. I explain how, by applying a new technology, the state can make it possible to provide all needed services without having to levy *any* taxes at all! Read the book, run for your legislature, and let's get busy making this country work like its founders wanted it to. Don't leave this for "someone else" to do. $5 (30)
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Moondoggle: After reading René's book, *NASA Mooned America*, I read everything I could find on our Moon landings. I watched the videos, looked carefully at the photos, read the astronaut's biographies, and talked with some of my readers who worked for NASA. This book cites 25 good reasons I believe the whole Apollo program had to have been faked. $5 (30)
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The Radar Coverup: Is police radar dangerous? Ross Adey K6UI, a world authority, confirms the dangers of radio and magnetic fields. $3 (34)
Three Gatto Talks: A prize-winning teacher explains what's wrong with American schools and why our kids are not being educated. Why are Swedish youngsters, who start school at 7 years of age, leaving our kids in the dust? Our kids are intentionally being dumbed down by our school system — the least effective and most expensive in the world. $5 (35)
Aspartame: a.k.a. NutraSweet, the stuff in diet drinks, etc., can cause all kinds of serious health problems. Multiple sclerosis, for one. Read all about it, three pamphlets for a buck. (38)
One Hour CW: Using this sneaky method even *you* can learn the Morse Code in one hour and pass that dumb 5wpm Tech-Plus ham test. $5 (40)
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Code Tape (T13): Once you know the code for the letters (41) you can go immediately to copying 13 wpm code (using my system). This should only take two or three days. $5 (42)
Code Tape (T20): Start right out at 20 wpm and master it in a weekend for your Extra Class license. $5 (43)
Wayne Talks Not at Dayton: This is a 90-minute tape of the talk I'd have given at the Dayton, if invited. $5 (50)
Wayne Talks at Tampa: This is the talk I gave at the Tampa Global Sciences conference. I cover cold fusion, amateur radio, health, books you should read, and so on. $5 (51)
$1 Million Sales Video: How to generate extra million in sales using PR. This will be one of the best investments your business ever made. $43 (52)
Reprints of My Editorials from *73*.
Grist I: 50 of my best non-ham oriented editorials from before 1997. $5 (71)
Grist II: 50 more choice non-ham editorials from before 1997.$5 (72)
1997 Editorials: 148 pages. 216 editorials discussing health, ideas for new businesses, exciting new books I've discovered, ways to cure our country's more serious problems, flight 800, the Oklahoma City bombing, more Moon madness, and so on. $10 (74)
1998 Editorials: 168 pages that'll give you lots of controversial things to talk about on the air. $10 (75)
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NASA Mooned America: René makes an air-tight case that NASA faked the Moon landings. This book will convince even you. $25 (90)
Last Skeptic of Science: This is René's book where he debunks a bunch of accepted scientific beliefs – such as the ice ages, the Earth being a magnet, the Moon causing the tides, and etc. $25 (91)
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Barter 'n' Buy

Turn your old ham and computer gear into cash now. Sure, you can wait for a hamfest to try and dump It, but you know you'll get a far more realistic price if you have it out where 100,000 active ham potential buyers can see it, rather than the few hundred local hams who come by a flea market table. Check your attic, garage, cellar and closet shelves and get cash for your ham and computer gear before it's too old to sell. You know you're not going to use it again, so why leave it for your widow to throw out? That stuff isn't getting any youngerl

The *73* Flea Market, Barter 'n' Buy, costs you peanuts (almost)—comes to 35 cents a word for individual (noncommercial!) ads and $1.00 a word for commercial ads. Don't plan on telling a long story. Use abbreviations, cram it in. But be honest. There are plenty of hams who love to fix things, so if it doesn't work, say so.

Make your list, count the words, including your call, address and phone number. Include a check or your credit card number and expiration. If you're placing a commercial ad, include an additional phone number, separate from your ad.

This is a monthly magazine, not a daily newspaper, so figure a couple months before the action starts; then be prepared. If you get too many calls, you priced it low. If you don't get many calls, too high.

So get busy. Blow the dust off, check everything out, make sure it still works right and maybe you can help make a ham newcomer or retired old timer happy with that rig you're not using now. Or you might get busy on your computer and put together a list of small gear/parts to send to those interested?

Send your ads and payment to: *73 Magazine*, Barter 'n' Buy, 70 Hancock Rd., Peterborough NH 03458 and get set for the phone calls. The deadline for the February 2000 classified ad section is December 10, 1999.

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Updates

"PIC Key, PIC Key" (Sept. 1999, p. 10ff.)

Our thanks to Professor Lynden McIntyre N8RXL of Sinclair Community College in Dayton, and others, for pointing out the following oversights in the Table 1 assembly language listing on page 12.

1. Line 2: LIST P=16F84 should be in the second column, not first.
2. Line 3 _ _ CONFIG 0X3FF3; RC CLOCK OSCILLATOR should be in second column, not first. Also, it should begin with two distinct underscores (between which we have put a space here for emphasis).
3. Under "CPU equates", there should be a new line inserted under "count2": COUNT3 EQU 0X0E ;FOR DASH DELAY
4. Also under "CPU equates", both "movlw" listings should be replaced by "MOVLW".
5. Also under "CPU equates", listings "tris porta" and "tris portb" should be respectively replaced by "MOVWF TRISA" and "MOVWF TRISB". (These suggestions are made by the 16F84 data sheets, and have not been verified as we go to press.)
6. Under comments for both "DOT" and "DASH", the spelling should be "subroutine," not "subrouting."
7. Under "subroutine DOT", "subroutine DASH", and "subroutine PAUSE": "MOVLW", not "movlw".
8. Also, "subroutine PAUSE" should contain "D '13'", not "d '14'".

73 Amateur Radio Today

NOVEMBER 1999
ISSUE #469
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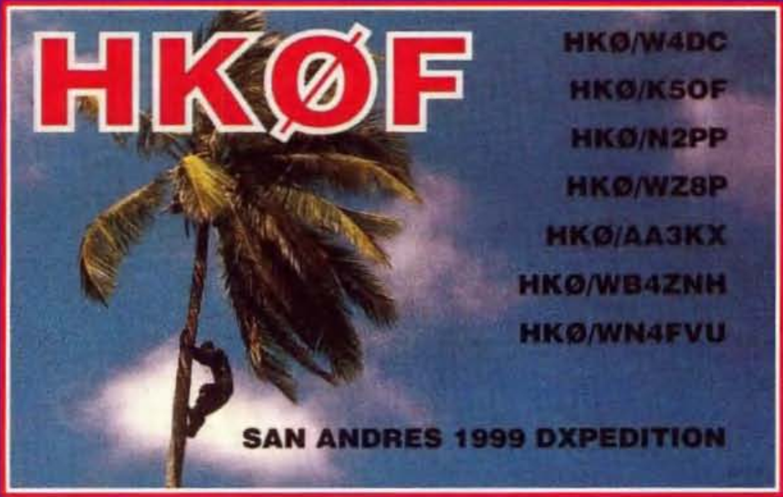

DXing and you — page 14

Manuscripts: Contributions for possible publication are most welcome. We'll do the best we can to return anything you request, but we assume no responsibility for loss or damage. Payment for submitted articles will be made after publication. Please submit both a disk and a hard copy of your article [IBM (ok) or Mac (preferred) formats], carefully checked drawings and schematics, and the clearest, best focused and lighted photos you can manage. "How to write for 73" guidelines are available on request. US citizens, please include your Social Security number with submitted manuscripts so we can submit it to you know who.

NOVEMBER 1999
ISSUE #469

73® Amateur Radio Today

TABLE OF CONTENTS

FEATURES

REVIEW

DEPARTMENTS

Contest Winners
Page 62

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On the cover: DXing and you meet up on page 14. We are always looking for interesting articles and cover photos — with or without each other. Your photo could be mentioned in this space *next* month, and our check could be on its way to *you!* You couldn't use a little extra cash?

Feedback: Any circuit works better with feedback, so please take the time to report on how much you like, hate, or don't care one way or the other about the articles and columns in this issue. G = great!, O = okay, and U = ugh. The G's and O's will be continued. Enough U's and it's Silent Keysville. Hey, this is *your* communications medium, so don't just sit there scratching your...er...head. FYI: Feedback "number" is usually the page number on which the article or column starts.

73 Amateur Radio Today (ISSN 1052-2522) is published monthly by 73 Magazine, 70 N202, Peterborough NH 03458-1107. The entire contents ©1999 by 73 Magazine. No part of this publication Marchbe reproduced without written permission of the publisher, which is not all that difficult to get. The subscription rate is: one year $24.97, two years $44.97; Canada: one year $34.21, two years $57.75, including postage and 7% GST. Foreign postage: $19 surface, $42 airmail additional per year, payable in US funds on a US bank. Second class postage is paid at Peterborough, NH, and at additional mailing offices. Canadian second class mail registration #178101. Canadian GST registration #125393314. Microfilm edition: University Microfilm, Ann Arbor MI 48106. POSTMASTER: Send address changes to *73 Amateur Radio Today*, 70 Hancock Rd., Peterborough NH 03458-1107. 73 Amateur Radio Today is owned by Shabromat Way Ltd. of Hancock NH.

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NEVER SAY DIE

Wayne Green W2NSD/1
w2nsd@aol.com

Anniversary

I got a note from Dave Sumner K1ZZ, complete with a commemorative 60-year ARRL membership pin to wear on my hamfest hat. Now, if I can hold to my new diet and keep my body in good shape, and if amateur radio and the League are still around in 2009, I'll have a 70-year pin for my hat. Plus a commemorative plaque for my shack wall. Dave was kind enough to drive up to deliver my 60-year plaque in person!

It's kind of nice being a living link with the past. I was there in the "good old days," so I can explain to newcomers what things were really like 60 years ago — back in the pre-WWII days. Well, the war actually got started in Europe on my birthday, September 3, 1938, when I was 16 and having a ball on 40 CW. Yeah, I really did make CW contacts. Then I discovered phone and had even more fun on 160 and 2-1/2 meter phone. Then came Pearl Harbor and my enlisting in the Navy as an electronic technician for four years, complete with service on the USS *Drum* (now on display in Mobile AL) from 1943–45. I was on the air the day we were closed down for the war, and back on the day they opened the 2-1/2 meter band in December 1945, four years later. And I've been on the air having fun ever since.

The Odds

A little item in *Time* caught my eye. Well, it mentioned cancer and nursing homes. It seems that a recent study showed that 40% of the cancer patients in nursing homes get too little or no pain medication. Not even aspirin! I don't know if you've had a family member who died of cancer, but when I lived in Brooklyn the guy across the street did and his screams of pain could be heard day and night until he finally died.

This is, of course, of little importance to you if you are not ever going to (a) live in a nursing home and (b) get cancer. Well, unless you change your lifestyle significantly, your odds are not good. Around 60% of our elderly are ending their days in nursing homes, where there is nothing to do and the food sucks. Add to that the 40% who will get cancer (heading toward 50% as we continue to smoke and sugar ourselves to early deaths), and you are playing against serious odds.

How come all the pain? Well, two things. First, there's the cost of drugs, and second, the medical police and the drug enforcement people are out there looking for any doctor who's been prescribing painkillers. Several have lost their licenses just through prescribing painkilling drugs for terminal cancer patients.

Both cancer and a nursing home are avoidable if you stop doing bad things to your body. Oh, to hell with the fat, the nursing homes, and the incredible pain of cancer, pass me another doughnut. Right?

The Other Shoe

Since the Kenneth Starr investigation started with Whitewater, even a not very perceptive person might wonder how come the released Starr report didn't mention this. This will, I suspect, be the other shoe to drop. Between the leaks and White House spinmeisters, anyone can be forgiven for being confused about the Whitewater mess. Maybe I can clarify it for you.

This all started back in Arkansas, where the Clintons were partners with Jim and Susan McDougal in the Whitewater Development Corporation. The accounts were kept in the Madison Guarantee Savings & Loan, run by Jim McDougal, with Hillary Clinton as an attorney. When Federal bank examiners checked Madison, they testified that it was a "corrupt institution that routed millions of dollars to politically connected Arkansans." The report cited wire fraud, illegal campaign contributions, embezzlement, money laundering, falsification of loan records and board minutes, etc. The FDIC had to cover over $60 million that was looted.

Part of the money stolen by McDougal and Hillary went right into Bill Clinton's campaign account.

The reason a special prosecutor had to be called in was the obstruction of investigations at both the state and federal levels by the Clintons, the same pattern we've seen repeated with Bill's sex scandals.

I Don't Believe ...

Several readers recommended I read Mally Cox-Chapman's *The Case For Heaven — Near Death Experiences as Evidence of the Afterlife* (Putnam's Sons, 1995, ISBN 0-399-14024-7, 203pp., $20). Mally has interviewed hundreds of people about their near-death visit to heaven, and the stories they tell have a compelling similarity. Other than being more expensive and a little slow going, the stories are not much different from those in a number of other "light" books I've read.

Yes, I also read *The Skeptical Inquirer*, which steadfastly refuses to accept the paranormal, reincarnation, past lives, spoon bending, psi, clairvoyance, psychokinesis, UFOs, contactees, Roswell, cold fusion, and so on. I have no problem with skepticism, as long as it isn't pathological. Well, the *Inquirer* has its "I don't believe" shtick, which is just as much a belief as in UFOs or any of the organized commercial religions.

While I don't approach anomalies as a skeptic, I am not an easy convert. I want to see convincing evidence. And as I read well-researched books and talk with people who have obviously done their homework, I tend to give credence to their views.

Naturally, skeptics believe that spoon bending is bunk. But only if the skeptic hasn't done much research. One of the books in my wisdom guide is Michael Creighton's *Travels*. It's a fascinating book. Nonfiction. He tells about his years in medical school. He also tells about his skeptical approach to auras and spoon bending, and his amazing experiences. It's a pocket book, so don't be so chintzy. Read it and then tell me he's full of baloney. Dare.

Are you going through life with "I don't believe ..." blinders on?

Once I have managed to pry your blinders open a tad, maybe I can get you to start reading about the mysteries of water, magnetism, and a host of other anomalies that are mis- or at least poorly understood. I'm in way over my head trying to learn about so many things. I need your help.

Continued on page 6

Number 6 on your Feedback card

LETTERS

From the Ham Shack

Dr. Bill Schenker KG4DHJ, [wjs@linkfast.net]. This is to announce the formation of the "Y2K Net," an amateur radio alternative communication system for post-Y2K in the event that we lose all telephone service (which includes cell phones and the Internet). We have announced plans for the net on two Y2K Web sites:

1. TimeBomb2000 [http://www.greenspun.com/bboard/q-and-a-fetch-msg.tcl?msg_id=001PTT]
2. Steve Heller's Y2K site [http://www.koyote.com/users/stheller/y2kneti.htm]

These sites can act as a meeting place for interested parties — look for the thread "The Y2K Net is starting."

The current sked for the Y2K Net is nightly, 2000Z CT, 14.275 primary, 7.245 secondary, 3.905 tertiary. If necessary, slide down to find clear spot, try for 10 minutes or so, then go to next freq. We are hoping to establish local and hopefully regional nets.

Finally, I suggest that those hams who want to participate in the Y2K Net put their E-mail address in the [www.QRZ.com] database file. That way we can contact each other about future sked changes.

Harold F. Byrd, Chula Vista CA. A friend, Chuck O'Harra of Chandler TX, has a son who is a computer consultant. He gave me the following info:

Windows 95, 98, and NT will default into "00" in the year 2000 unless the following corrective measures are taken:

1. Double click on "My Computer."
2. Double click on "Control Panel."
3. Double click on icon "Regional Settings."
4. Click on "Date" tab at top of page. It probably will show a two-digit year where it says "Short Date Sample." That is the *default* setting.
5. Click on the button across from "Short Date Style" and select the option mm/dd/yyyy. NOTE: There *must* be 4 y's showing, not 2.
6. Click "apply," then click "OK" at the bottom.

Easy, fast, simple. 73

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UPDATES

Thanks from us and author Parker Cope to Ed Butorajac for pointing out an incorrect **Fig. 2** in W2GOM/7's article "All About Op Amps," which appeared in our August issue. A correct **Fig. 2** is shown here.

Likewise, a grateful Vlad Skrypnik UY5DJ joins us in thanking Ernie Laney K5ENL and others for pointing out an incorrect URL that Vlad inadvertently used in his article "PIC Key, PIC Key" (September). The correct URL under Note #3 should be: [http://home5.swipnet.se/~w-53783]. 73

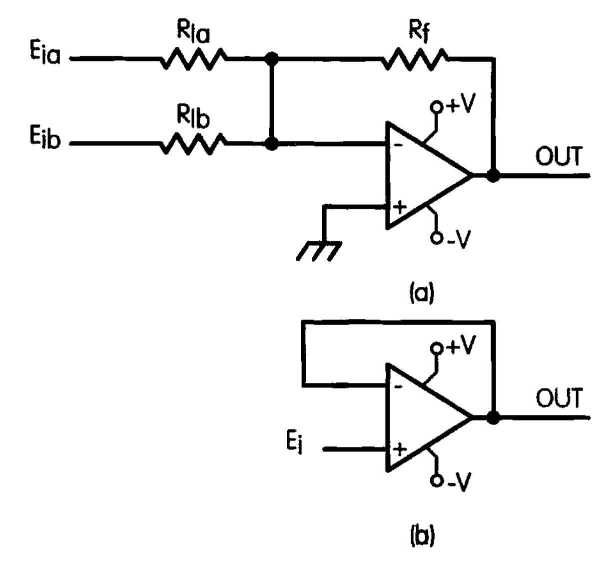

Fig. 2. (a) Summing amplifier with inverted output. (b) Buffer with noninverting output.

NEVER SAY DIE

continued from page 4

Why? (Thanks, WBØFGK)

If corn oil comes from corn, where does baby oil come from?

Why do they put Braille dots on the drive-up ATM keypad?

If nothing sticks to Teflon, how do they get it to stick to the pan?

What has four legs and an arm? A happy pit bull.

Education

You're only going to have the opportunity to make real money when you have your own business. But before you waste a lot of money learning what you need to know to start and run your own business, you want to get other people to happily pay you to learn. And they'll do it, as I've explained before. Several times.

Once you have a job with a small company in a field that is fun for you, you are in school as well as working. You want to use the opportunity to learn how to deal with bookkeepers, accountants, lawyers, bureaucrats, politicians, customers, suppliers, bankers, printers, mailing houses, ad agencies, the post office, and so on.

When you've learned all you can working for one or two small companies, it's time to look for a job as the manager of a company in the business so you can build your management and motivational skills. But, even more important, this is the time to get enough pay to start salting away a startup nest egg and looking over the market for a product to sell.

When I started *73* magazine, I sold my boat, plane, Arab horse, and Porsche to get enough to print the first issue. Well, owning all that stuff was one way of saving and enjoying my savings at the same time. You know, I've never wanted a Porsche, a plane, or a boat again. Been there, done that. I did get another Arab horse when I sort of lucked into it, but in retrospect that was a mistake. The fun and excitement for me is in new things — new experiences.

My envelope supplier had a young Arab stallion he had to sell. He'd run out of money. I bought the horse and broke him to the saddle, but I just didn't have the interest to train him as thoroughly as I

Continued on page 56

QRX . . .

Number 8 on your Feedback card

Four C's of Emergency Communications

Tom Currie N4AOF recently suggested a few simple ways to improve your overall emergency communications capability. Although Tom has a background with Kentucky REACT, his advice can apply to any organization utilizing emergency communications, either paid or volunteer:

The best advice for anyone performing emergency communications can be summarized by the four C's: Calm, Courteous, Correct, and Concise.

CALM. Try to keep emotion out of your voice. No matter what the emergency, a calm, professional attitude will help keep things cool and get the message through more quickly and accurately. Losing your cool, calm attitude may cost an important message. The more reason you have for getting excited, the more important it is for you to remain calm. As an emergency communications volunteer you should set a good, calm example for the other people to follow.

COURTEOUS. You must think of yourself as a public servant. Regardless of provocation, remain courteous at all times. Never display temper on the air. Remember the "Golden Rule" at all times and practice it. Never fight with other operators over calls or reports. Always follow the instructions of the Net Control Station — whether you agree with those instructions or not. Most problems can wait until after the emergency situation is over. If some problem absolutely must be ironed out, do it by telephone or on another frequency — not on the net.

CORRECT. Work to keep errors out of your communications. Use the phonetic alphabet and repeat the message where appropriate to get names, locations, and other information accurately. Write everything down for reference. Remember, your role is communications — you are not in charge of anything. Most communications will be between the people who are in charge. When the Emergency Operations Center or Net Control Station asks a question, go get the answer from the person responsible, don't just give your best guess. It is always better to admit you don't know rather than give out information that is wrong. Always use plain language! Don't use jargon, Q-signals, 10-codes, etc., which may not be understood by everyone. Avoid using specialized words and codes, even those of the agency you are supporting unless the message is going specifically to the same agency.

CONCISE. Your job as an emergency communications volunteer is to get the message transferred while also allowing time for the other operators to get their messages transferred. Avoid tying up the net, by keeping your transmissions as brief as possible. Always leave a few seconds between transmissions in case someone needs to break in with an emergency call. A strictly business attitude is your best technique for ensuring timesaving communications. You must consider the conditions — if everyone is full-quieting, there is little need to spell words, but if conditions aren't good or the word is particularly difficult, then it makes sense to spell it. Don't rush — speaking a little bit slower often gets the message through faster because the other operator doesn't have to ask for repeats. Don't assume everyone has a pad and pencil instantly ready when you need to send him a long or complex message — ask first, which it saves time in the long run.

Thanks to *The Ham Arundel News* (MD), October 1998.

Hams to the Rescue

Greek ham radio operators were among the first to tell the outside world when a massive earthquake struck near the historic capital city of Athens on Tuesday, September 7th. Called one of the worst quakes to hit the Athens area this century, the magnitude 5.7 tremor toppled buildings and other structures in an Athens suburb, knocking out telephone and other normal lines of communications.

According to initial news reports, it was hams who first reported that the death toll had climbed past fifty shortly after the quake rolled through the area.

Stateside, ham radio may be responsible for saving the life of a firefighter involved in Plumas County (CA) fires. Everett Gracey WA6CBA in Reno reported that on Saturday, September 4th, firefighter James Monty was with another firefighter who suffered multiple bee stings. The bee venom put the unidentified firefighter into anaphylactic shock. Monty administered drugs to stabilize the other firefighter and then tried to radio for help using normal fire command radio channels. Owing to the terrain and their isolated location, he was unsuccessful.

But Monty had thought to program one of the ham radio emergency frequencies into his firefighting support radio. He called there and was answered by a ham who passed the information to a RACES operator in the fire communications center. A rescue helicopter was immediately dispatched, and transported the victim to the hospital. Gracey says that it is quite possible that the radio operators helped save this firefighter's life. WA6CBA notes that it is ham radio operators who have volunteered many hours to help fill in the holes in the area's firefighting communications network.

Thanks to *Newsline*, Bill Pasternak WA6ITF, editor.

Top 10 Immutable Laws of Antenna Construction

10. Any given piece of wire is at least 3 inches shorter than you need.

9. In the unlikely event that you have trees in the right places, they won't be tall enough to use for about thirty years.

8. Performance of an antenna is inversely proportional to the time and money spent on it.

7. An allband antenna can be resonated on all bands except the one you need at the time.

6. HF propagation will always be available, twenty-four hours a day, on some band that you don't have an antenna for.

5. The more accurately you measure the materials for an antenna, the more likely you will make a mistake.

4. The more directional an antenna is, the more likely it will be pointed in the wrong direction.

3. Rotation time for a yagi will always be equal to or greater than the time it takes a signal to disappear.

2. A computer model is an effective way to demonstrate how an antenna that works well should not work at all.

And the Number 1 Immutable Law of Antenna Construction:

1. Anything will work as an antenna to some extent, but nothing will work as well as it should.

Thanks to *Low Down*, official journal of the Colorado QRP Club [cqc@aol.com].

FCC Relaxes Rules for Spread Spectrum

The FCC has relaxed rules governing the use of spread spectrum techniques by radio amateurs and opened the door to the possibility of international spread spectrum communication. The Report and Order in WT Docket 97-12 adopted August 31 concludes a proceeding that originated with an ARRL petition in December 1995 and has been pending since 1997.

The FCC adopted rules that will allow Amateur Radio stations to transmit additional spread spectrum emission types. Once the new rules were effective November 1, hams will be able to use techniques other than frequency hopping and direct sequence spreading. In addition, the new FCC rules will permit US hams to use spread spectrum techniques to communicate with amateurs in other countries that permit SS. Spread spectrum communication has been limited to stations within FCC jurisdiction.

The new rules require that spread spectrum stations running more than 1 W incorporate automatic transmitter power control. Amateur stations using SS are restricted to a maximum power of 100 W.

Continued on page 45

Need a UHF Dipper?

Part 2: Coupling to an outside environment.

Hugh Wells W6WTU
1411 18th Street
Manhattan Beach CA 90266-4025

Part 1 of this series discussed the theory of resonators as used within the older UHF TV tuners and measurement techniques. Part 2 continues with a discussion regarding coupling the tuner, as a dipper, to an outside environment.

Sense loop

For a dipper to function, an external sense loop must be provided so that the dipper will have access to the unknown resonant circuit. For the typical dipper, the sense loop is also the internal resonating element that determines the frequency of the dipper. The design of the dipper allows the resonator to be mounted external to the dipper's box. Then, as the operational frequency rises, the resonator loop gets smaller, making it very difficult to "reach" into the unknown circuit.

The TV tuner design has its resonator mounted in a channel so that access to the outside world is very difficult unless a coupling loop is added to the circuit. Adding a sense loop to the oscillator of a tuner does present some problems that have to be worked out through experimentation. In order to convert the tuner to a dipper, I've elected as a first priority to get the oscillator operating at the desired frequency band. A sense loop may be added using one of the two schemes discussed later, since tuners vary in the way they respond. Both schemes will have to be tried and evaluated in order to select one over the other. A suggested sense loop is shown in **Fig. 1**, where the dimensions are only approximate.

I've observed several factors relative to the sense loop that may be of concern to some users. The loop has a natural resonant frequency that may fall within the frequency range of the oscillator. Another possible concern is the dip reaction that is a function of energy absorption from the oscillator. Another concern is the oscillator's reaction to a sense loop located near the oscillator's resonator. I've observed quite a variation from tuner to tuner, so that experimentation with the loop is necessary.

The actual depth of the dip is a function of the coupling factor and energy absorption from the oscillator by the resonant circuit being tested. One of the simple tests that works most of the time is to check the loop's reaction to hand capacity. As with a typical dipper, placing the hand on the sense loop

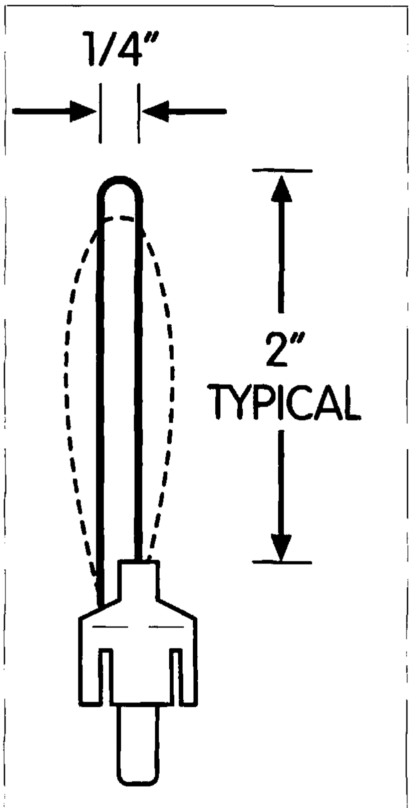

Fig. 1. Typical sense loop mounted on a phono connector. Initial dimensions are shown. The dotted line indicates a possible change in the profile when used with the dipper.

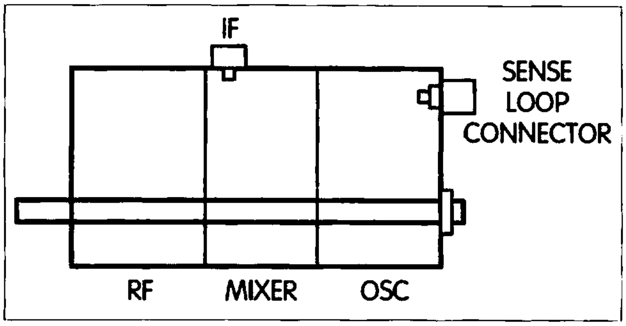

Fig. 2(a). Suggested mounting location of the sense loop connector.

should cause a reaction that is observable on the meter.

When the sense loop resonates within the tuning band of the oscillator, a dip may be observed within the tuning range of the tuner-dipper. Therefore, it's desirable to place the loop's resonant point outside of the tuning range of the oscillator. Or, the dip caused by the sense loop may just be ignored.

I've found that mating phono connectors work well for mechanically supporting the sense loop. Soldering the female connector to the wall edge provides the needed mechanical stability. When the sense loop connector has been placed in a final location, a wire may be formed and soldered over the top of the mounting portion to increase the mechanical support of the connector, as shown in **Fig. 2**. It is important to place the connector close to the corner of the tuner's box, adjacent to the cold end of the resonator.

Sense loop schemes

There are two sense loop connection schemes that appear to work, but each is tuner dependent and the one that works best with your tuner may be the better choice. The first scheme is to connect the sense loop through a capacitor to the RF end at the mixer diode. The oscillator's injection loop is then shared by both the diode and the sense loop. The second scheme is to use a separate pickup loop as part of the sense loop circuit. Each of the sense loop schemes has an advantage and disadvantage requiring evaluation.

The objective of the sense loop is to allow absorption of RF energy from the oscillator by an external resonator. Yet, the coupling factor must be minimized to allow the oscillator to continue oscillating with minimum sense loop loading. Therefore, adding a sense loop means that the loading on either the diode or the oscillator will occur depending upon the connection scheme that is elected. Paralleling the sense loop and the diode works well sometimes.

Having the sense loop linked directly

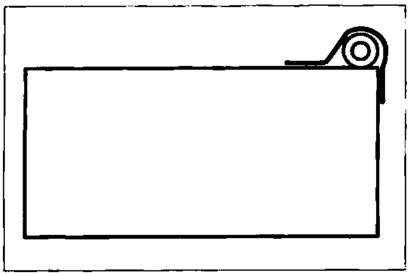

Fig. 2(b). Increasing the mechanical rigidity of the connector by soldering a wire over the mounting portion.

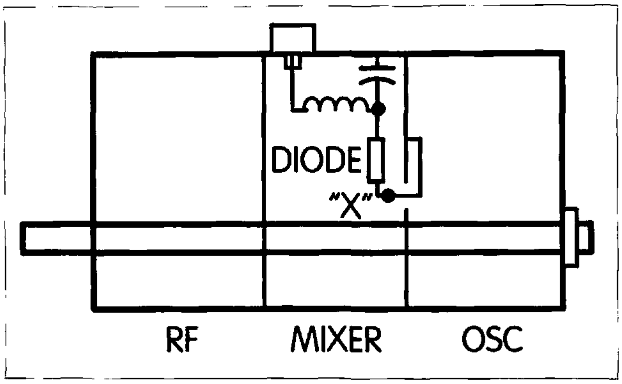

Fig. 3. Typical location of the mixer diode and the sense loop connection when the capacitor scheme is used.

to the oscillator resonator may sound like a better choice, but it creates a new set of issues that must be resolved. Any loop of wire placed near a distributed resonator will be "seen" as a parallel inductor by the resonator, causing it to increase in frequency depending upon the amount of coupling between the two. In addition to affecting the resonant frequency, the loop will also upset the oscillator's feedback, creating an interesting effect. At some points within the tuning range the resulting "dip" indication will be normal, while at other points the oscillator's RF level will actually increase. Regardless of a dip or peaking condition, a reaction occurs, providing an indication of resonance at the test frequency.

Fig. 3 shows both the typical mixer diode mounting and a suggested point for attaching the sense loop if this scheme is selected. Some tuners have the diode body mounted in the wall, and when that's the case, the connection should be made on the oscillator side of the wall as close as possible to the diode body.

When both the diode and the sense loop use the same oscillator injection pickup loop, it is suggested that a coupling capacitor be used between the sense loop connector and the diode as shown in **Fig. 4**. The capacitor value is not critical, as its function is to break up a DC path through the sense loop. Capacitance values between 50 and 470 pF have proven to be satisfactory. The precaution for using the capacitor is that some tuners actually have a DC bias placed on one end of the mixer diode. Although the bias value isn't required in the dipper project, it's easier to accommodate the circuit than to modify it.

Using a separate sense loop pickup loop presents some interesting situations that do not have a "cookbook" solution. Several loop positions must be attempted in order to find the one method that works best. Keep in mind that the objective of the loop is to allow an external resonator to absorb energy from the oscillator. The "sticky wicket" is being able to sense the absorption by the external circuit and simultaneously indicate that absorption by a dip on the meter. It sounds easy, but may not be because the RF field level detected by the diode must also be reduced when absorption occurs. In some cases, placing the pickup loop close to the diode loop works because the field pattern around the diode loop is disturbed when absorption occurs.

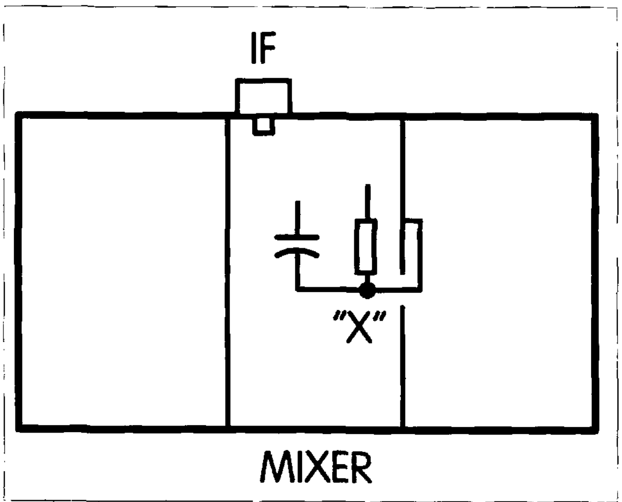

Fig. 4. A coupling capacitor is used when the sense loop and diode share the same pickup loop.

In other cases, absorbing energy directly from the resonator works because total oscillator power is reduced during absorption.

Three starting loop positions for placing the loop are shown in **Figs. 5(a), (b)** and **(c)**. So far, as I've observed, the sense pickup loop should be placed within the I field of the resonator. The best position for the pickup loop can be determined only through trial and testing. Sensitivity to hand capacity is a simple and positive indication of "working."

Testing

Before applying power to the oscillator, a few jumpers need to be installed to disable three circuits. The first one is to ground the varactor's voltage control terminal when a varactor is used. Then a jumper wire needs to be soldered from the top of the variable capacitor/resonator to ground for both the RF and mixer circuits as shown in **Fig. 6**.

Supply voltage for the oscillator should be regulated for stability, but may be any voltage from about 12–20 volts. Some oscillators work well at low voltages and others require 18–20 volts after being modified. I recommend about 15–16 volts as a starter, in order to keep down the transistor's dissipation.

With the sense loop removed and with a meter monitoring the rectified DC output from the mixer diode, the meter should move upscale when the voltage is applied to the oscillator. The next step is to rotate the variable tuning capacitor while observing the meter. Under normal circumstances, the meter's indicated level will move smoothly up and down the scale as the capacitor is rotated, but the indication should not go to zero.

Once the meter's amplitude and variations are noted, install the sense loop and repeat the tuning rotation. If

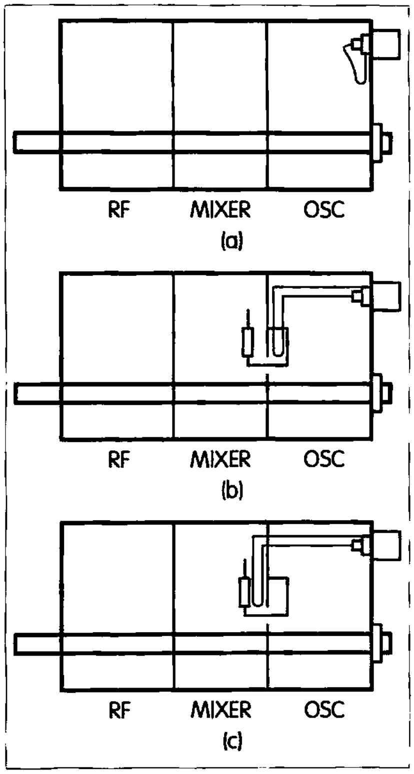

Fig. 5. Typical locations for sense loop trials when this scheme is used. (a) Shows a short loop placed in the I field close to a wall. (b) The pickup loop is extended and placed next to or over the diode injection loop. (c) The extended pickup loop is placed close to/or over the diode.

no abrupt changes occur in the amplitude, then the sense loop is not affecting the oscillator. However, there may be a decrease in the meter's amplitude indication as a result of connecting the loop. Some adjustments in the loop's profile and/or length may improve the meter's amplitude and dip response. A decrease may occur in the meter's indication when the sense loop shares the diode loop because of loading. The "fix" is to continue operating at a lower meter current level.

At this point, the oscillator should be operating over the "stock" operating frequency range of about 470–900 MHz. Using whatever means is available, measure the frequency at each end of the tuning range so that you'll have a reference of where the oscillator is now as a starting point for the next step in the modification process. If an absorption wavemeter is to be used, then now is the time to calibrate a point or two on its scale.

The use of the absorption wavemeter will provide clues as to the depth of the dip as observed by the tuner-dipper. Sometimes the wavemeter being tuned in proximity to the sense loop provides a better dip indication than does tuning the dipper in proximity of the wavemeter. This phenomenon is caused by loop loading and sometimes by the narrow tuning range of the tuner-dipper's oscillator after it has been modified.

Parts 1 and 2 provided discussions regarding the use and testing of a UHF mechanical TV tuner used as a dipper. Part 3 will describe progressive modification steps that may be used to shift the operating frequency range of a UHF tuner into an adjacent ham band. 73

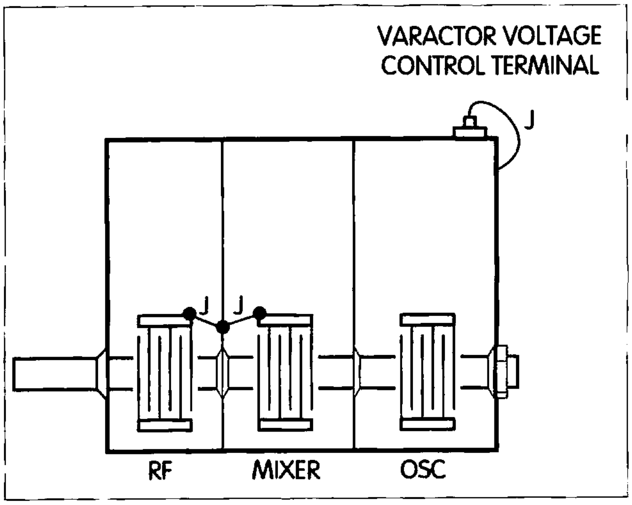

Fig. 6. Jumper wires added to disable RF, mixer sections, and the varactor.

Planning a DXpedition

Here's what to do if you take Wayne's advice ...

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Woodbridge VA 22193

As a result of Wayne's persistent urging to go and do something interesting, about every four years members of the Woodbridge Wireless Inc. (WWI) go on a DXpedition. This year, we went off to San Andres Island, Colombia HKØF. In 1995, it was Montserrat VP2MFM; in 1991, it was zone 2 in Canada VE2/WD4KXB; and in 1986, it was Cayman Island ZF2HI. All of these DXpeditions were very successful, and coincided with a major contest. But the real common thread for all these DXpeditions is a systematic approach to planning. My crutch for doing this is the Planning Task List shown in **Table 1**. This list for DXpedition planning should work for all but the most rare destinations. I go through this list so thoroughly that some members of the team say, "Denis, don't take all the fun out of it!" But even with all the planning, there are still many unknowns. The more problems you can solve at home, the more fun you will have on the DXpedition. I will briefly examine each item and relate it to our most recent DXpedition, so you, too, can join in on the fun of successful DXpeditioning.

Item #1, country selection, actually goes on in conjunction with items #2, #3, #4, and #5, since they are all related and can influence country selection. We make a list of DX countries that haven't been really active recently, and which also fit the contest we plan to operate. If it's the CQWW contest, we look at countries in the rarer zones. If it's the ARRL DX contest, we look at the rarer DX countries not too far from the States. You can decide what your country selection process will be. The only restriction that our group has placed on our selection process is picking a place with electricity, since the cost of a DXpedition is really impacted by having to take gasoline and generators. With this restriction, only the rare uninhabited DX entities

***Photo A.** San Andres ham Richard Bard HKØHEU meets author Denis Catalano W4DC. Richard was of great assistance to the HKØF DXpedition team.*

are omitted from our universe of choices. We also determine how difficult obtaining a license will be. If the chances of getting a license are very low, you may want to leave that country to the very serious DXpeditioners. You also have to be able to get to where you want to go. So investigating the transportation options (#5) is also instrumental in choosing a country. By this time, I usually have a core group together who are really interested in going on a DXpedition. This not only splits the planning workload, but also gives ownership to the team members.

Continuing the planning process, we usually start out with a long list of DX countries and end up with a short list, after going through the process. With the short list in hand, we try to contact other hams, both stateside and resident hams, who have operated from the DX locations being considered. I call these items intelligence (#2) and local liaisons (#3). This is much easier today with the Internet and E-mail than it was just ten years ago. Also, while contacting the DX hams, you should be building friendships that will pay off later. Richard Bard HKØHEU (see photo) became our primary DX point of contact and, based on his inputs, we

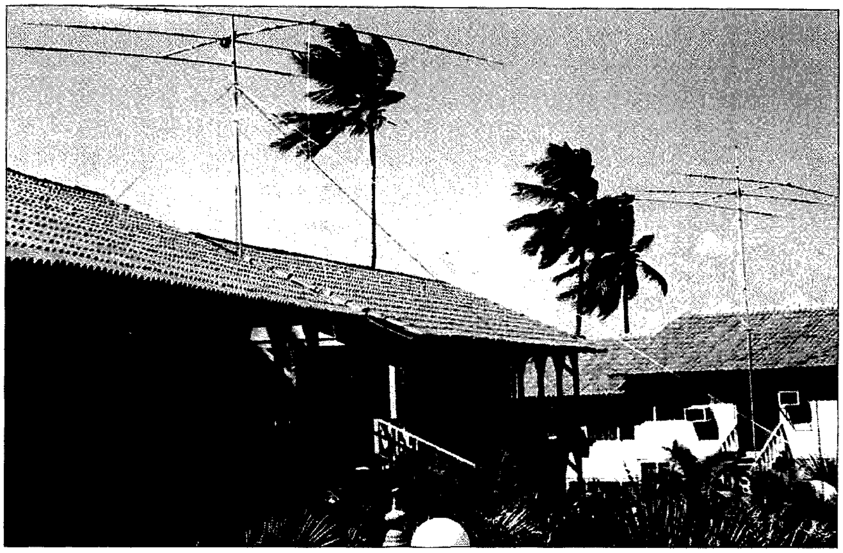

Photo B. The HKØF team mounted their two yagis on water pipe purchased on the island.

DXpedition Planning Tasks	
#	**Task**
1	Country selection
2	Intelligence (contact visitors/hams)
3	Local liaisons (DX country hams)
4	Licensing
5	Transportation to DX location
6	Team selection
7	Accommodations/slte selection
8	Local transportation
9	Customs info and contact
10	Equipment coordination
11	Computers
12	Financial accounting
13	Home page
14	Sponsorship
15	Publicity
16	T-shirts
17	Setup
18	Operating strategy (category, headings, propagation, op skeds)
19	Food
20	Photography/video
21	Score submission
22	QSL chores (design, print, manage)

Table 1. DXpedition Planning Task List.

selected San Andres Island. Once the country has been selected, the planning really goes into high gear.

Next, we recruited the rest of the team (#6). We started with members of our club who wanted to go on the DXpedition, and then filled in empty slots with others who have participated in our past DXpeditions. We always try to take one person who has never been on a DXpedition, but has a burning desire, and at least basic operating skills. The main thing to remember here is that the group needs to be compatible and willing to work together. The San Andres operating team was made up of Ed Pitts K5OF, Carl Henson WB4ZNH, Martha Henson WN4FVU, Everett Jackson WZ8P, Vic Walz N2PP, Jack Ference AA3KX, and me. Jack was the WWI member who never had been on a DXpedition, but really was anxious to go. It turned out great, with Jack doing most of the CW duty. With the DXpedition team formed, weekly messages (E-mails) were sent to each team member summarizing the status of each task that had been assigned to one or another. We also formed a support team. These were mostly club members who wanted to be part of the effort. They helped take care of licensing arrangements, communications home, local transportation, computer programming, the home page, QSLing, T-shirts, and many other tasks.

We had already started the licensing (#4) and transportation (#5) investigation as part of the country selection, so with a country selected and a team recruited, these items were worked through to completion. For our DXpedition to San Andres, neither of these tasks was easy. First of all, most travel agents and airlines have never heard of San Andres, so much of the legwork was done by us. Since there are no direct flights from the U.S., we had to find alternate connections. One was through Bogota, Colombia, and the other through San Jose, Costa Rica. Two members of the team took the Bogota route, while the rest of us went through San Jose. Because of the sporadic and frequently changing flight schedules of the connecting airlines, it took most of us an extra day in both directions. Up until the week before departure, we weren't sure of the secondary airline schedule, but everything worked out in the end.

Getting our licenses was also a bit difficult, but with the help of the American Embassy in Bogota, we received our slant calls (to be used before and after the contest) about fours weeks before our departure. Our request for a special contest call initially went unanswered, and we then decided on using my call HKØ/W4DC for the contest. After being on the island four days (one day before the contest), we received word on the air from several American hams that our contest call had been issued and the Colombian Radio League was trying to get in touch with us. Things worked out, and we received a fax several hours before the start of the contest — HKØF had become a reality!

Finding suitable accommodations (item #7), which had not been too difficult on prior DXpeditions, turned out to be more difficult since rental properties weren't the norm on San Andres. In fact, we only found three choices available. The final selection for our DXpedition QTH was the Caribe Campo Hotel, located in San Luis on the east side of the island. The food task (#19) was basically eliminated on this DXpedition, since the Caribe Campo had an all-inclusive food plan that turned out to be terrific. Even with all the planning, we still weren't sure that the hotel villa that we rented was going to work out. Just a few weeks before our departure, we were notified that the hotel villa would not be available. Again, everything worked out in the end, and the hotel rooms we used actually added more flexibility to the antenna situation. Even though we were treated very nicely by the hotel staff, the electrical power and water (especially hot water) was sporadic. In fact, most of us didn't have a hot shower all week, but no one complained since everything else worked out so well — and after all, this was a DXpedition. Planning for local transportation (#8) was also completed. The choices were renting a vehicle or depending on taxis, buses, or local hams. We found rental cars to be very expensive, so we decided on taxis this time out.

Items #9, #10, and #11 go hand and hand, and are the most involved of all the DXpedition tasks. Equipment coordination takes lots of negotiation and planning between all the team members.

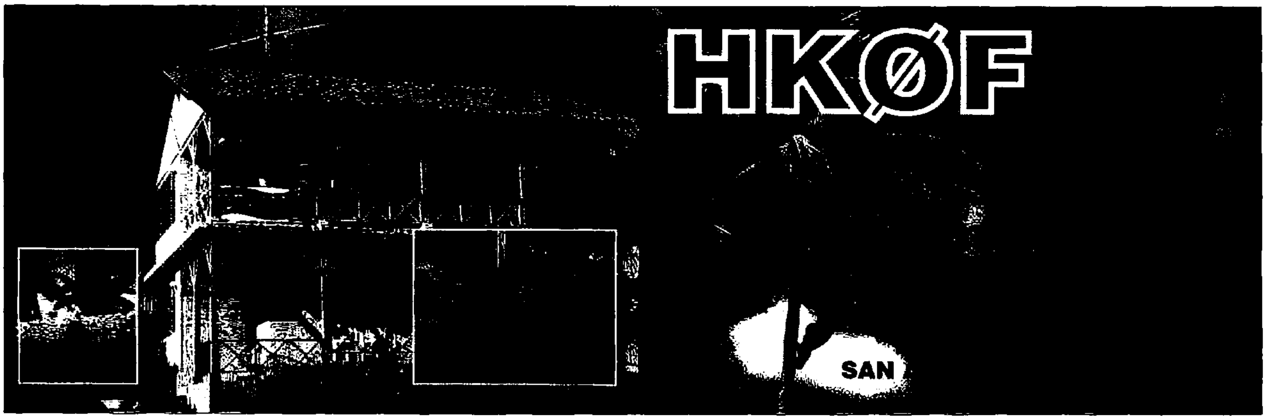

Photo C. Featured on the folding QSL card cover (back at left, top at right) is an islander who was paid $10 to climb the palm tree to attach the dipoles.

You want to choose a leader for these tasks who is organized and determined. The customs planning was also complex — keeping track of and certifying all the equipment. Even though we didn't use much of the official paperwork, it was better to be prepared than to be sorry. An overall operating strategy (#18) was developed, since it impacts the type and quantity of equipment and computers. Our basic strategy was to have a two-station DX/contest expedition, Field Day–style, with the group bringing and setting up all stations and antennas. We decided to operate in the multi-two category during the ARRL DX phone contest, and to concentrate on CW and RTTY before and after the contest. The equipment list turned out to be over 10 pages long and included three amps, two beams, two verticals, three transceivers, three computers, numerous tools, wire, over 1000 feet of coax, RTTY gear, and many other accessories. The only items that we didn't carry with us were antenna masts/towers — we purchased 60 feet of two-inch water pipe on the island to support the antennas. Consequently, the group shared over $900 of overweight baggage charges.

The actual setup (#17) wasn't as completely planned because we had no idea of the lay of the land. So two members of the team arrived two days earlier than the rest of the group, to survey the situation and get things laid out. They arranged for an islander to climb palm trees (at $10 a tree) to erect our wire antennas (see photo featured on our QSL card). They also scoped out the vertical field, and purchased the support pipe. When the rest of the team arrived, the yagis for 10/15/20 meters were put up relatively quickly (see photo), but the verticals for 80m and 160m took a lot of time to set up properly. The advance team selected one of the four hotel rooms as the radio shack, and doubled up in the remaining three rooms as sleeping quarters. Some "re-wiring" had to be done in the rooms to support the two 220 VAC amps. In all, it took about four days to set everything up the way we wanted, which is one reason the "on the air" time before the contest was a bit limited. We tried to keep a RTTY station on the air since this mode was frequently requested.

Many of the other planning items are self-explanatory. One team member kept track of group expenses and collected group monies (#12). We had a support team member from Woodbridge Wireless develop and maintain the home page (#13). It was extremely successful, and includes a log checker and a guest book for comments (check out the Woodbridge Wireless home page, which has additional information about all four of our DXpeditions [http://www.pwcweb.com/wwi/]). We didn't really seek out much sponsorship (#14), but did get the loan of two vertical antennas from Force 12. I took care of the publicity (#15), which consisted of press releases to all the DX bulletins and magazines when the time was right. Like most DXpeditions, we made T-shirts (#16) for the group that also doubled as gifts to our helpers here and abroad. Wearing our T-shirts with the words "Radioaficiondos" seemed to help going through customs. We also assigned a lead person for photography and video (#20). Once home, I had the task of pruning four hours of videotape into a 15-minute video with authentic island music (15-minute professional videos are available on loan for both the VP2MFM and HKØF DXpeditions). Score submission (#21) turned out to be harder than anticipated because the merge function wouldn't work with so many Qs. Lastly, but not trivial, are the QSL design, printing, and managing tasks (#22). Our group decided to do it up right with a color foldout card (**Photo C**).

All of the planning paid off. The HKØF contest operation alone totaled 11,785 QSOs. After the contest, operations continued using the individual HKØ/home callsigns with emphasis on CW and RTTY. The final QSO totals before and after the contest by mode were 1093 on RTTY, 3236 on CW, and 2144 additional phone Qs, for a grand total of 18,258 QSOs for the San Andres DXpedition. If you still need a QSL for any of the DXpeditions, send an SASE via my *Callbook* address. Now, start planning a DXpedition of your own!

Why Not ß-Morse?

An amusing way to preserve your Morse code.

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Nowadays Morse code is waning its way out of civilian sectors as well as military ones. The work required for its conservation lies mainly in the hands of radio amateurs and other practitioners who have been led to it by trade, interest, or simple curiosity.

As you probably know, the actual International Morse code can produce the real international alphabet, containing letters outside the Roman alphabet (seen here) that also have their Morse counterparts in dots and dashes. These letters are used in languages such as Russian, Greek, Arabic, Hebrew, and so forth.

However, each character composed of dots and dashes is out of visual proportion with its equivalent letter, the former being more of a linear shape than the average shrunken shape of the latter. With these in mind, why not build characters out of the actual Morse code? They should have all the qualities of commonly used alphabets, with each character simple and easy to read, and abiding by these simple-to-follow rules:

1. Each letter shall be composed of four or fewer elements (dots or dashes).
2. Each successive element shall turn at ninety degrees right from the previous one, and this angle shall replace the original space.
3. Only letters of the alphabet shall be used; signs or numbers shall remain the same for any language.
4. Accentuation and syllabication shall remain the same as in the original language.

The new characters, in their separated and compact form, would be well adapted to handwriting, contact printing such as typewriting, TTY, or other means of printing, or simply to be read from a screen. Software would be also feasible for other font-type generators such as computers and microprocessors.

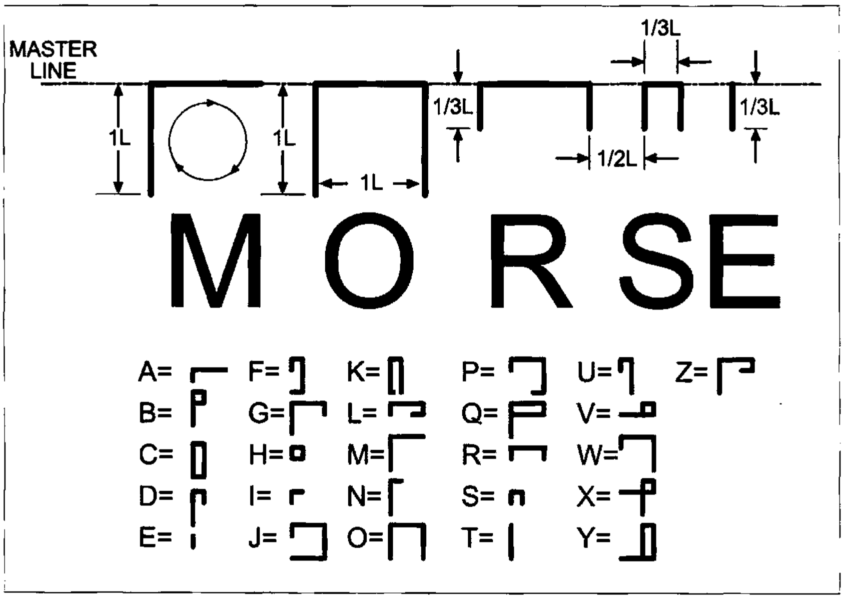

Fig. 1. β-Morse illustrated.

Continued on page 43

Building a Better Collins

Add this $1 solid state replacement part to your 30S1.

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It's often said that "necessity is the mother of invention." And to my mind, never has this cliché been more true than when I attempted to search out a reasonably priced Collins 30S1 linear amplifier replacement component for this vintage piece of radio gear. Anyone in a similar situation knows full well that it's almost a contradiction in terms to find an adequate supply of anything labeled Collins at a cost that's considered even remotely reasonable.

Take, for example, the almost impossible task of locating the Amperite (115NO180) 120 VAC [Readers should note that original voltages in Collins and similar vintage equipment were of course listed as 115 VAC; we have changed these to the more modern convention of 120 VAC. — ed.], 180-second time delay ballast tube with normally open contacts. Its singular task is to fundamentally time and control the entire interlock circuit. This component is the absolutely essential ingredient in that series of intricate circuits that delay the application of high voltage to the plate of the tube until the indirectly heated cathode has reached operating temperature.

How, exactly, is the timer designed to do what it does? When powering up the amplifier, one function is to route 120 VAC to the relay heater. The resistive wire winding is designed to generate heat, causing the bimetallic strips to move together and to complete the circuit mechanically. In concept,

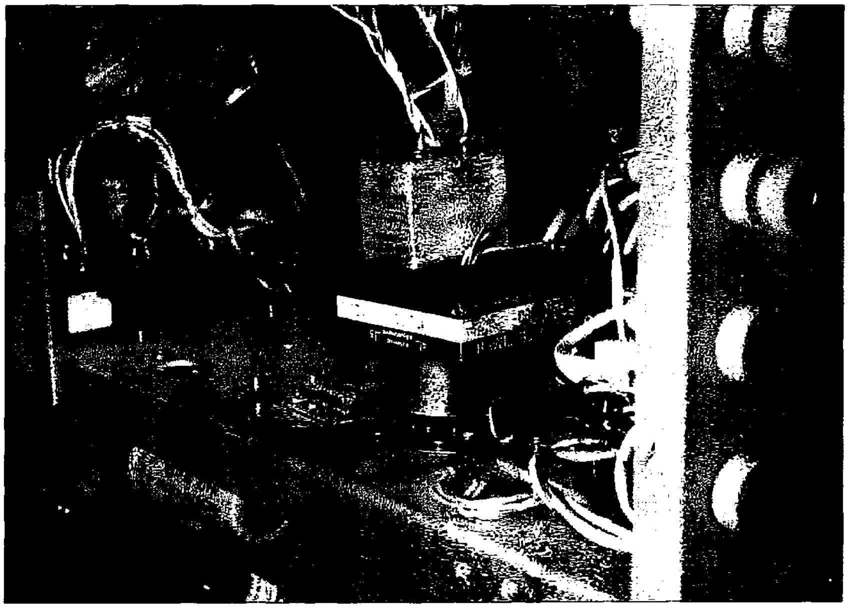

Photo A. *A view of the replacement time delay module. Note the module overhang above the diodes. You'll need clearance for K203 (barely visible) to the rear of the timer package. The wires above the 120 VAC [see text note in column 1 re 120 VAC] ice cube-type relay are connected to a second set of normally open contacts on the relay and will eventually control voltage to the two bulbs behind the plate and antenna tune dials. See text for details.*

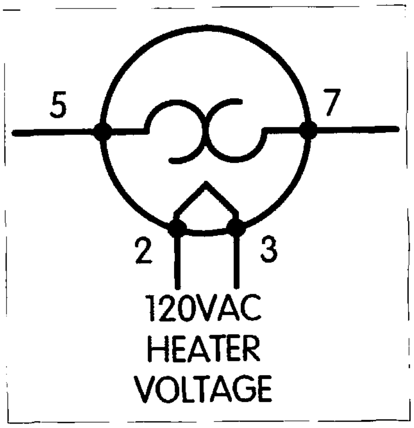

Fig. 1. A schematic representation of the three-minute time delay relay as it appears in the Collins manual.

it's a little like the optional bulb that comes along with the string of Christmas lights to make them "blink."

In any event, a 30S1 outage caused by this malfunctioning tube was personally experienced by yours truly when the 120 VAC heat generating wire in that timer tube suddenly let go. It worked well for a Saturday morning 40 meter swap net, but when fired up the next day, it was as dead as the proverbial doornail. I guess its time was up and it went out in a flash like a light bulb.

A quick continuity check across pins 2 and 3 of the tube confirmed my worst suspicions. The circuit was open. In hindsight, I guess it was a reasonable thing to expect, especially since this tube was the original Collins part installed well over 30 years ago. In my naiveté, I thought all I needed to do was to plunk down a couple of bucks for a replacement and that case would be closed. Checking out some sources of supply resulted in a heart-stopping, pulse-quickening, shortness-of-breath experience, when I learned that this lowly tubelike component, when and if available, commanded a $75–$125 price tag — a premium a bit too dear for me to swallow, especially since I have two 30S1s. However, I'm happy to say that after a tearful weekend of lamenting the tragedy, as well as suffering a loss of appetite, a clearer head prevailed and a unique and cheap solution became apparent.

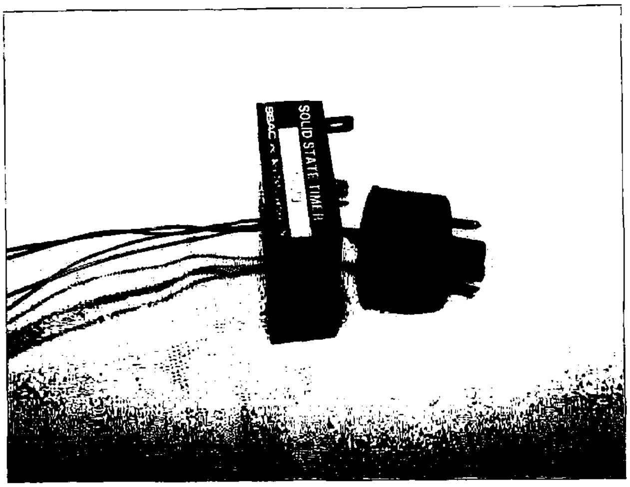

***Photo C.** Two pair of color-coded wires have been soldered to the appropriate pins of the socket. After passing the lengths of wire through the hole in the center of the timer module, epoxy the socket in place. See the instructions for correct positioning to ensure clearances.*

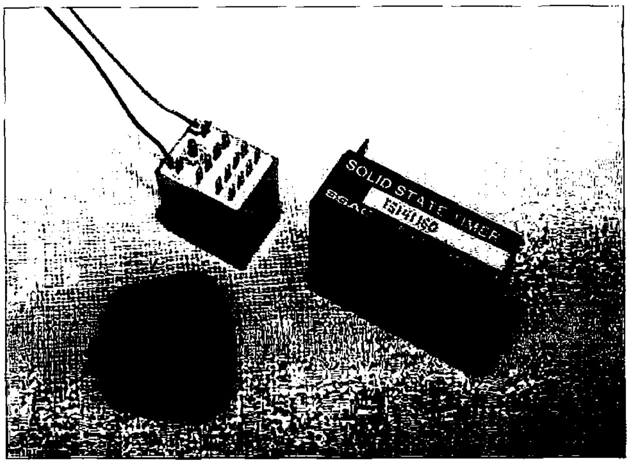

***Photo B.** The three components comprising the replacement timer in the 30S1. Note that an octal socket has been hollowed out. Any type of 120 VAC relay will work. Pictured is a 4PDT. The two wires have already been soldered to the coil input. The solid state hockey puck–style timer is completely epoxy-encased except for the two fast-on connectors. One is visible on the upper left side of the module. The module has application in any home-brew amplifier deck project using an 8877 or the 3CX800A7 tube requiring a three-minute delay.*

There was a better and cheaper way!

A careful look at the 30S1 schematic was all that was necessary to conjure up a safe, quick, inexpensive, and far better alternative to biting the bullet and paying big bucks for a replacement OEM plug-in relay from some supplier who felt that he was doing me a favor by taking my hard-earned money. I also realized that the wiring of this tube is relatively uncomplicated to understand and offered no surprises if any repair was contemplated.

For example, there are only two 120 VAC input connections at the tube socket (pins 2 and 3) to the heat generating glow-in-the-dark windings within the tube that close the contacts. (See **Fig. 1**.) There are two remaining connections (pins 5 and 7) that are needed to complete the first leg of the interlock circuit. 30S1 owners are aware that the time delay tube is conveniently found on the relay shelf of the amplifier, so it's no big deal getting to the part and doing whatever maintenance is necessary.

Even more gratifying, I discovered that there was more than sufficient room around the tube socket to do what I had in mind with a somewhat larger replacement component. What made me even less gloomy about the amplifier downtime was the fact that all the wiring connections could be made directly from a stripped down octal socket without any modification whatsoever to the original circuit.

My confidence in solving the big cash outlay dilemma was based on a catalog retailer's advertisement I had responded to some time earlier. The company offered a solid state 120 VAC, 180-second (a 150-second

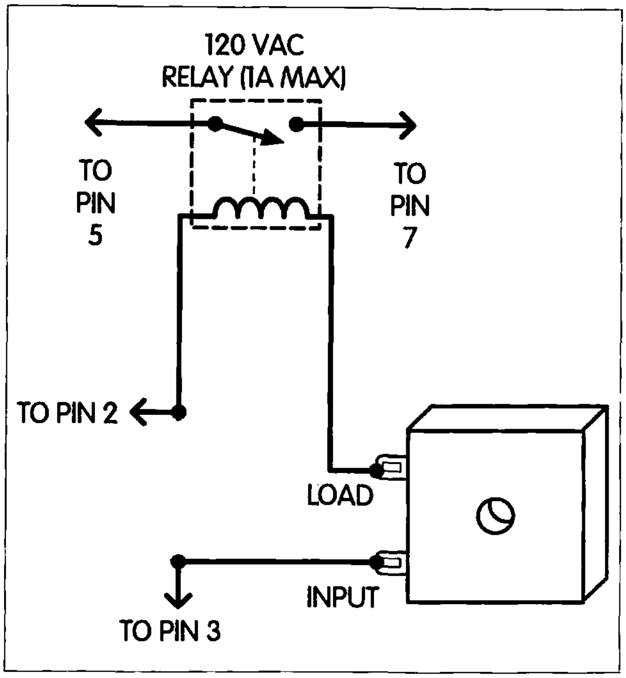

Fig. 2. Simplified wiring scheme. Pin 2 and Pin 3 refer to socket K202.

heavy-duty unit also available) time delay relay for one dollar. At that time, I purchased a bunch of them for a project requiring a timed delay for a pair of 8877s nested comfortably on an RF deck. The component worked flawlessly in that similar time delay circumstance, so I was assured of success in this application.

Basically, the timer circuit is completely clad in epoxy (see **Photo B**), except for a pair of fast-on hookup terminals protruding from its hockey puck design. Since it's completely enclosed, it's impossible to figure out how it works. What counts is that it operates flawlessly each and every time, so needing to know about its innards is strictly academic.

It's configured to control voltage to any 120 VAC appliance with a rating of up to one amp. To get it working, feed one leg of the 120 VAC line to the "Input" side of the cube. Wire the "Load" side (in this case) to one terminal of an outboard SPST (NO) relay. Hook up the other hot leg of the 120 VAC line directly to the remaining terminal on the relay coil. Plug it in and start counting "one thousand one, one thousand two ..." After exactly 180 seconds, the contacts on the outboard relay mysteriously close and the rest is history. If that sounds interesting, read on!

What's first to do?

In order to assemble the sclf-contained, plug-in module components necessary to replace the tube-type relay, all that's needed is an octal (8-pin) tube socket base, the one-buck module, and an SPST or SPDT (more on a DPDT option later) 120 VAC relay with about a 3–5 amp normally open contact rating. There's nothing critical here, so just about any relay will work. It is interesting to mention that even though my time delay tube was a goner, I couldn't bring myself to trash it for its base. It was a little like having difficulty saying good-bye to a lifelong friend. I guess the thought flashed through my mind that through some divine intervention, it might

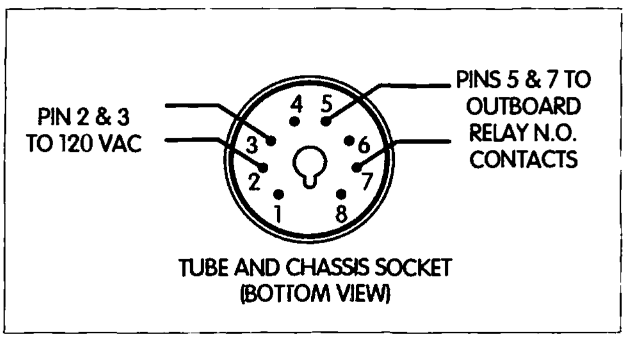

Fig. 3. Bottom of time delay tube socket showing pin numbering.

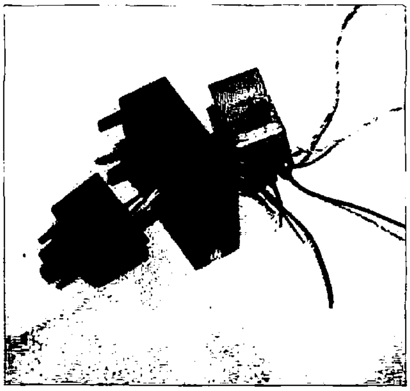

Photo D. An "exploded" view of the component parts. Note the two fast-on connectors. Epoxy the socket base and relay to the module. The pair of striped wires in the upper right will control the two bulbs behind the plate and antenna tune dials.

somehow come back to life at a later date. As an alternative. I found an old circa 1960s tube in the junk box that in a sense was given a partially new life for the new millennium by donating one of its "vital organs" to a good cause.

One quick thought! In your search, you may come across a tube with fewer than 8 pins. That might be OK to use just as long as pins 2, 3, 5, and 7 are in place. Many of the vintage rectifier tubes fall into this category. Just remember that the pin locations are counted from the underside of the tube socket, so pay careful attention to the illustrations. It can get a bit confusing — especially if you're like me and not especially good with spatial relationships.

To get rid of the glass envelope, wrap the tube in an old towel and carefully break it with a hammer. Stay away from hammering around the plastic base. It's fragile. Cut out all the interior wires and remove the embedded glass within the socket base.

Using a soldering iron, apply some heat to each of the four identified pins to soften the solder and free the remnants of the wire within the pin. Simultaneously, hit your hand sharply on the table top and the solder will eject itself. Make certain that the tube prongs are open to the interior of the socket. If you've gotten this far, the hardest part of the job is behind you.

Assembly is simple

Strip off about one inch of insulation from two 6" lengths of solid wire and solder one end to pin 2 and one length to pin 3 of the hollow socket. When positioning the wire from the inside of the socket, make certain it extends beyond the length of the pin for a good solder connection. Clip off any excess. Since high current is not an issue, I found that four conductor, solid telephone hookup wire works well. It might be a good idea to color code the interior connections. It's amazing how quickly you can forget what wire goes where. I used red for the 120 VAC. Do the same thing with a pair of wires (I used green) to pins 5 and 7. Refer to the pictorial for pin numbering. If any mistakes are made, they will be made here. I know full well, because I made them.

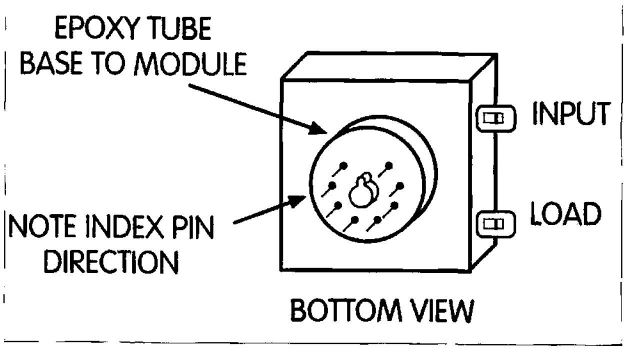

Fig. 4. Location of hollowed out octal tube base prior to bonding to timer module with epoxy. Positioning is vital to ensure clearances on relay shelf. Note the position of the indexing pin with respect to the fast-on connectors on the module.

I completed the whole job (epoxy and all) and plugged it in. I'd still be waiting for the unit to time on if I didn't suspect I made a wiring error. I forgot that looking at the base of the tube is not the same as looking at the base of the socket. It was that mirror image that confused me; however, I reconciled myself to that careless error by claiming that no one works on tubes any more. I'll only say that a word of caution to the wise is usually sufficient!

Pass the bundle of wiring from the hollow tube socket (four strands) through the convenient hole found in the time delay module. (See **Photo C.**) At this point, you might want to take some time to epoxy the socket to the underside of the time delay module. To ensure clearance with relay K203 on the shelf, orient the socket indexing pin as shown in my pictorial. Position the module so that the two fast-on terminals, protruding from the module, are to the right. The socket is placed closest to you with the indexing pin facing away (up). Clamp it in place or use a rubber band until the epoxy hardens.

Make certain to get this orientation right. You'll want the timer module to overhang the diodes on the relay shelf and stay well away from relays K203 and K201. Epoxy a small outboard 120 VAC SPST (NO) or SPDT relay (no other voltage will work) to the top of the timer module. Center it on the module. Height clearance is no problem in the 30S1, so any size 1 amp relay you have will work fine. Solder one length of red wire from either pin 2 or 3 to the input terminal on the module. It's clearly marked, so there's no problem with which wire goes where.

Connect a short length of wire from the remaining load terminal (also marked) to one of the coil windings on the relay. Trim to length and solder the remaining red wire from the socket pin to the other coil connection of the outboard relay. The two remaining green wires are connected to the normally open contacts on the outboard relay. If you happen to have a DPDT relay, make certain that you connect to the terminals that close (make) on contact. That's about it. Plug it in, replace the amplifier front panel, and fire it up.

Collins owners are a strange lot!

Collins 30S1 owners know full well that no ready light indication is incorporated in the amplifier design. That's a pain in the you know where, especially if you're in a sudden hurry to

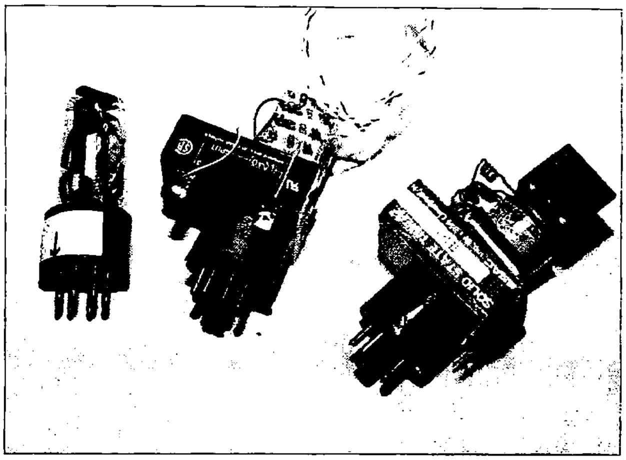

Photo E. A view of the now defunct timer delay tube along with two almost similar versions of its replacement. A careful look at the base of the tube will reveal how worn the tube was after years of service. The indexing pin had long ago broken off and the label and arrow helped to position it correctly in the socket. The modules are identical in design except that one relay is enclosed and the other is an open frame. The module to the left clearly indicates the input and load terminals described in the text. The solid state module will only control a 120 VAC relay.

chase some DX and you don't have a stopwatch to time the delay. All you can do is continue to push the high voltage button until the circuit kicks in.

Obviously, there's got to be a better way. Since it would be considered sacrilegious to drill a hole in the amp and install some kind of green-for-go pilot light, that option is out. However, remember that we just installed an outboard relay on top of the timer module, so if you elected to use a DPST unit, you'd have an extra set of contacts doing nothing for you after the delay has been satisfied and the relay closes.

Since drilling new holes in any piece of Collins gear is out of the question, here's an alternative that even the die-hard Collins owner can accept without any recrimination. When powering up the amplifier, both the multimeter and the plate and tuning dial lights are instantly on. Consider cutting the wire from the low voltage power source to the two lights behind the plate and tune dials. Connect a pair of light gauge wires to the two cut ends and dress the sufficiently long length of wire back to the new relay. Solder the ends of this twisted pair across the unused set of normally open contacts at that point.

Again, make certain to leave the multimeter wiring intact so that it will continue to up light instantly upon power-up. The two bulbs behind the plate and antenna tune dials will remain dark until the 3-minute delay has been satisfied. When the relay kicks in to close the interlock circuit, the dial lights will simultaneously fire up and you're good to go without a wasted moment.

Continued on page 44

Parts Suppliers

Part	Part #	Price	Source
Solid state time delay relay (115 VAC 180 sec. delay timer 1 A load)	650-0013	$1.00	Mendelson Electronics Co. Tel. (800) 344-4465
Solid state time delay relay (115 VAC 150 sec. delay timer 10 A load)	660-0071	$2.50	
SPDT 115 VAC relay	480-1984	$1.95	
DPDT 115 VAC relay	275-217	$6.99	Radio Shack
DPDT 115 VAC relay	11-1481	$2.39	Surplus Sales Tel. (800) 488-3407

Table 1. Parts suppliers.

Isotron Notes

Simple tips straight from the Hart.

Thomas M. Hart AD1B
54 Hermaine Avenue
Dedham MA 02026

Two years ago, I purchased an Isotron antenna from the Bilal Company for 20 meter portable work. After placing the unit on a pole and finding that it does an amazing job for such a small unit, I decided to experiment a little.

I have had very good luck using a 1/4 wavelength wire radial on my 2 meter walkie. Tests with local hams indicated a big increase in my signal strength with the radial in place. It seems to me that there was even a commercial version of the add-on radial on the market at one point.

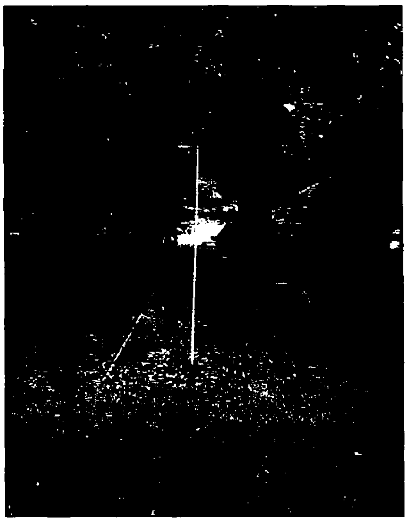

Photo A. Ten-foot pole in action.

The 20 meter Isotron, on top of a 10-foot temporary pole, was my next target for a "tail." I used the 1/2 wave dipole formula as follows:

(468/14.2) = 33 feet
(33 feet) times (105%) divided by (2) = 17.3 feet

The goal of my computations was to determine 1/2 wavelength, increase that by 5% (the usual increase for radials), and divide the product by two for 1/4 wavelength radials.

Using some Radio Shack plastic-coated braided wire for ease of winding and storing, I added a radial to the Isotron at the point where the U-bracket connects to the grounded part of the antenna. The radial simply runs in a convenient direction—away from the antenna.

Results: I can only offer experience, not actual measurements. During CW operations on the Scandinavian CW DX contest one year, I increased my contact rate by 100% after adding the radial. While I would like to believe that my rapidly improving contesting skills were the only reason. I have to believe that the radial played a part, too.

You might want to investigate this project and find a way to fine tune the radial for best results.

The ten-foot pole: portable antenna support

I have an MFJ 20 meter SSB/CW rig that I use for portable QRP operations

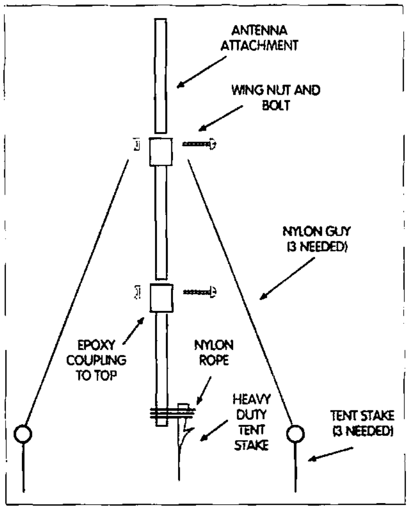

Fig. 1. AD1B ten-foot pole.

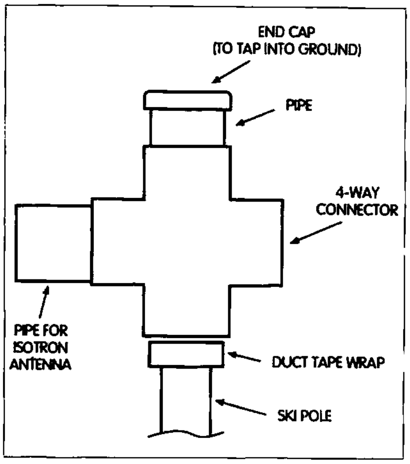

Fig. 2. Ski-pole mast.

in conjunction with an Isotron antenna. The need for an antenna support led me to design and build a ten-foot pole for hamming away from home. The support is made from two-inch-diameter PVC pipe cut into three sections for easy transport. Each section has a coupling epoxied to the end that allows attachment of the next piece. Ground fastenings are four tent stakes—a large stake at the base and three smaller ones for the nylon guy wires.

The dimensions are not critical—The whole design can be modified as needed. But it is very handy and makes a compact package when disassembled and wrapped up.

***Photo B.** Ski-pole mast.*

Isotron mast for portable operations

While taking my afternoon jog around the neighborhood last year, I spotted an old ski pole in the trash waiting for pickup. What a great base for my Isotron antenna, I thought.

I grabbed the ski pole from the trash barrel and continued my running, headphone stereo in one hand and ski pole in the other. Several neighbors called my wife to ask if there was a good reason that I was jogging along with a "spear" or if I had simply lost my mind. No, oxygen deprivation was not the culprit. I had had an inspiration!

I removed the handle and basket from the pole. A wrap of duct tape at the top of the pole increased the diameter enough to fit inside a 2-inch PVC pipe assembly used to hold the antenna on top of the "mast."

This thing works—I used it on a February school vacation trip to Maine and made a number of contacts on 20 meter QRP with my MFJ rig. The whole thing is very simple and cheap. In fact, you can get your own ski pole the next time the trash barrels are out at the curb waiting for the truck.

Basic Transceiver Tester

This fancy spin on some common components is a good beginner's project.

Klaus Spies WB9YBM
815 Woodland Heights Blvd.
Streamwood IL 60107
[WB9YBM@JUNO.COM]

Have you ever sent a radio in for repair, only to find out you could have fixed the problem yourself? With these simple ideas, you can save some time, money, and embarrassment.

The microphone tester will check your PTT as well as the element itself. The PTT is simply hooked in series with an LED and current-limiting resistor. When you push the PTT, the LED will light; if not, you have either a bad switch or an open in the cable. A bad cable will be indicated by a flickering LED (it flickers in sync with the movement of the cable). Typically, cables go bad at the major stress points — the connector at the radio, the strain relief at the microphone, or wherever it got caught in your car door.

The audio amplifier is a commonly available 1/2-watt amplifier IC found at Radio Shack. With even a modest communications-class speaker, I found a half watt to be more than adequate in output power. The main thing to remember, especially if you're going to use the amplifier for other experiments in the ham shack, is to buy a log potentiometer. I bought an on/off switch that I mounted to the rear of the potentiometer; this way, I could turn off this section of the tester when not in use, as well as make certain I'd start at minimum volume every time to avoid unexpected surprises.

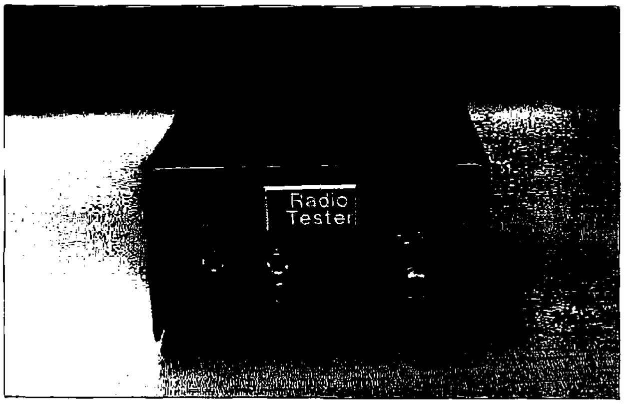

Photo A. The final version of the radio tester. The switch on the far left is the power switch; S1 and S2 on the schematic have been combined to a center-off switch (3P3T). The speaker jack is on the side; cable to the transceiver comes out the rear, with the power cable.

While talking into the microphone in a normal speaking voice, adjust the volume for a comfortable listening level (avoiding the high volumes that would cause feedback). By flexing the microphone cable, it readily becomes obvious if there are any intermittents in the cable.

The transmitter tester is also in two sections, which can operate independently of each other. If S1 is left off, S2 will toggle the radio into transmit without having to use a rubber band around the microphone's PTT (or some other inconvenient method). This

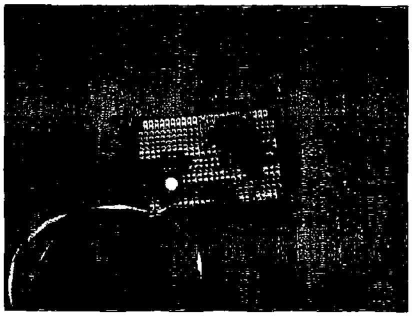

Photo B. The actual circuit (audio amp still to be plugged in — that was done in final assembly).

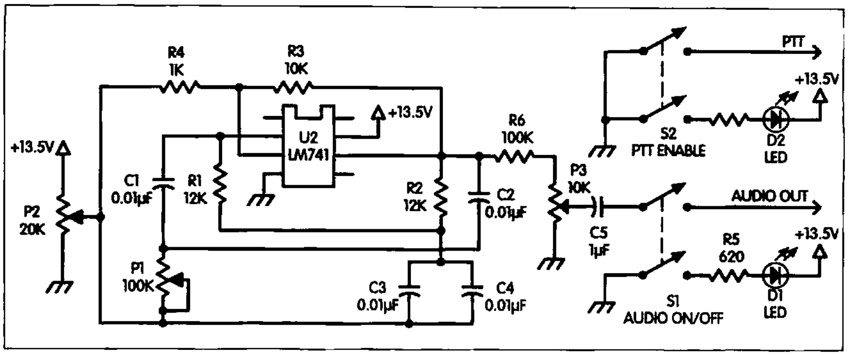

Fig. 1. Transmitter tester. Unlabeled resistor near S2 is R7, 620 ohms.

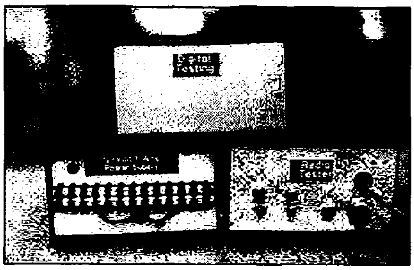

Photo C. A brief demonstration of the "mix 'n' match" station accessories I'm building (the digital tester is still under construction).

will allow both hands to be free to do whatever knob turning, instrument reading, schematic chasing, etc., that's required. Just don't forget a suitable dummy load on the antenna! Again, I use the ever-convenient LED as a status indicator — especially important here — so finals don't get fried (as in, "Oops, guess what I forgot to turn off?!"). Once SI gets turned on, audio is injected into the radio via the microphone connector (replacing the microphone with the cable from this tester).

The audio oscillator has been modified from a circuit on page 47 of a book published by Radio Shack, *Engineer's Mini-Notebook* by Forrest M. Mims III. First, I modified the circuit to allow single-supply operation via P2. Then I added a volume control. During my initial experiments, P2 consisted of two 10k fixed resistors. When I noticed that the circuit operated nearly rail-to-rail (when PI is adjusted to make the circuit oscillate), I noticed slight clipping on the bottom of the waveform. This was caused by the two 10k resistors not being totally identical (I'm using 5% tolerance components). To save money by not buying 1% resistors, I used a 20k potentiometer instead and adjusted it for exactly 1/2 of my supply voltage. By backing off slightly on P1, I could drop the output voltage slightly as well, so the amplifier isn't driven quite as hard.

Continued on page 44

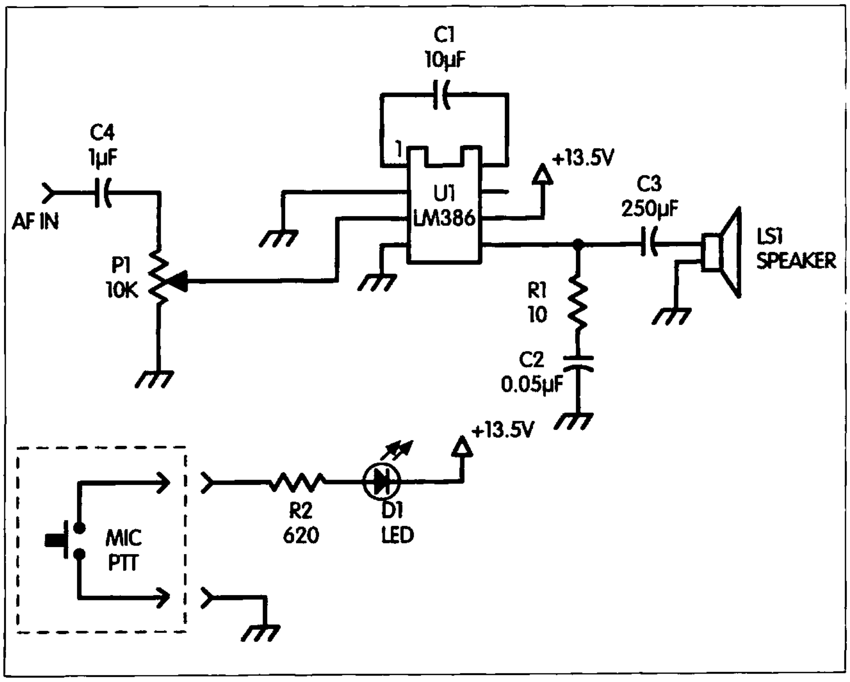

Fig. 2. Microphone tester.

Your Batteries Ready for Y2K?

Electrifying tidbits even you old-timers don't know.

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Elmendorf AFB AK 99506-6382
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Ham radio operators work with lead-acid battery strings, many without fully understanding all of the requirements for proper maintenance practice. Further, many hams will similarly perform maintenance on larger battery strings, such as those found in solar power plants or small hydro-powered systems — if not for themselves, then for their friends — and be subject to the same knowledge shortfall. Let's see if we can do a little enlightening.

I will start by identifying several types of lead-acid batteries that may be found in your station or solar plant, and then describe how to perform maintenance and tests on the battery. Standards exist within the power industry; I give you an example of these maintenance practices at the end of this article. You can take this information and see how it may fit into your specific station.

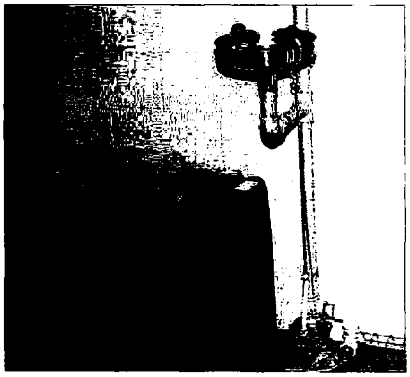

Photo A. Safety first! In commercial sites, a water shower is installed. You should have a ready source of water when you work on batteries.

One of the most common types of cell used in a station battery string is the "flooded cell." Often seen in solar power plants, electric golf carts, or as part of Uninterruptible Power Supplies (UPS), they can be considered a large capacity unit and contain significant amounts of free electrolyte. Be sure to check the battery Material Safety Data Sheet or technical specification sheet to find design voltage and internal loading. If you don't have this data, you can use the Internet to find the battery manufacturer — most have very informative Web sites. I have easily obtained this type of information within hours of starting a search, with the manufacturer most willing to Fax the information to the shack.

While the flooded cell is generally forgiving in terms of charge and discharge, it does present some well-known problems. There is a risk of sulfuric acid spills, and the process of charging batteries can generate explosive amounts of hydrogen gas. Before you start on any maintenance, be sure you have the proper Personal Protective Equipment (PPE) and understand basic safety precautions. Insulated tools should be used to perform any maintenance on your battery plant.

Start work with a close visual inspection. The larger cells typically found in solar plants have vented caps to allow any gas to escape, while blocking sparks from reaching the internal portion of the cell. These caps require periodic inspection and, possibly, cleaning. Generally, a soaking in distilled water is all that is needed.

Sporadic maintenance or poor installation practices may cause the inter-cell connections to overheat or even cause the battery post(s) to melt down. Both of these conditions can lead to a short — resulting in a runaway condition that could cause a fire. Careful cleaning and a check on the torque of the link bolts should be performed annually. Most inter-cell links are covered with an anti-corrosive compound. You must remove and clean the link.

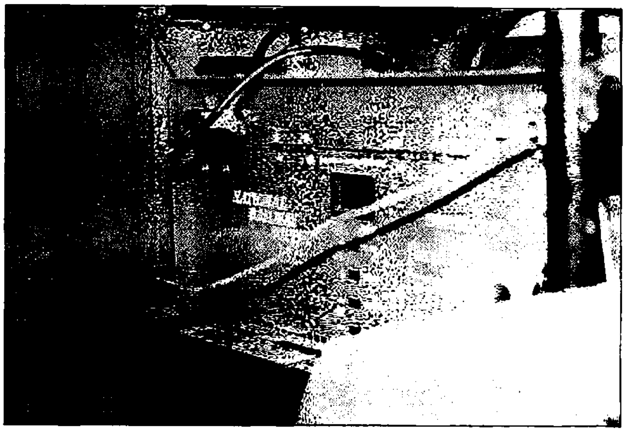

Photo B. A commercial battery tester.

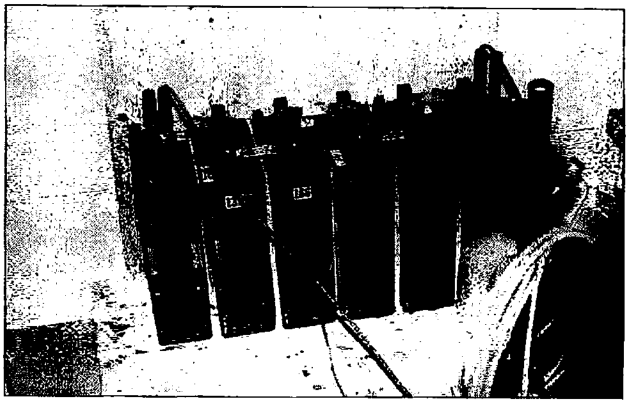

Photo C. Don't try this at home! A set of batteries under test load in a commercial site.

Next comes a close check for signs of heating or loss of link mass due to corrosion. Replace questionable links immediately! The battery must be removed from service to work on inter-cell connections — safety first!

Have you ever heard this: "We don't need to worry about those batteries — they're maintenance-free and leak-proof to boot!" The person here may be referring to a VRLA or Valve-Regulated Lead-Acid battery. They could also be referring to a "gel-cell" or gelled electrolyte battery, or possibly an Absorbed Glass Mat (AGM) battery or absorbed electrolyte battery. These common and dangerously erroneous assumptions about maintenance requirements and leakage could lead to a disaster.

All of these VRLA battery types feature a sealed case; however, the physics of how each battery functions are significantly different. Valve-regulated batteries are a type of sealed battery that, as the name implies, regulate the venting of excess hydrogen gas through a one-way valve or vent. VRLA batteries are often called "captured electrolyte" or "capture mat" batteries, or they may sometimes be called "recombination" batteries. These names indicate the internal physics of the battery, while the terms "vented" and "valve-regulated" specifically refer to the mechanical device allowing the battery to vent excess gas.

VRLA batteries can contain significant amounts of sulfuric acid, and they do vent explosive hydrogen gas. Worse yet, they are *very* sensitive to temperature and charge rate. If overcharged, VRLA batteries can go into internal thermal runaway and explode violently. I have seen the results of these battery explosions — they have the power of a bomb. If that isn't enough, some case swelling is considered "normal," though excessive case swelling will indicate trouble. All this can be confusing — suspect batteries or battery plants should be inspected by a professional battery technician.

Next on the list are "gel-cell" batteries. These are a sealed case type of battery that recombine the hydrogen formed in the recharging process with free oxygen to form water which, in turn, keeps the cell "wet," or hydrated. The term "maintenance-free" was

coined by battery manufacturers in order to market recombination-type batteries. Don't be fooled! These still require some regular maintenance

Batteries touted as maintenance-free are, in reality, "reduced maintenance batteries." It is not necessary to routinely monitor the hydration of these batteries as with the traditional flooded cells. These batteries should be inspected regularly for signs of stress. Two of the most reliable indicators of battery health are regular intercell resistance measurements and cell temperature measurements. All types of sealed batteries require careful charging and pose an explosion hazard. Maintenance of these systems will require a check of the temperature sensors that are part of any professional charging system. Do not exchange battery chargers without ensuring that the new unit is compatible with your sealed battery plant.

Photo D. These batteries have a flame arrestor vent cap, and access for a thermometer.

While the battery plant is off-line during maintenance, perform a voltage check on each cell. Record this for later use. You should track cell-to-cell impedance or internal resistance. This is the real limiting factor in your battery plant's charge and discharge current rate. You will need a load, a pair of accurate volt-ampere meters, hydrometer, thermometer, and safety equipment.

Begin by taking the battery string off-line; let it sit for at least two hours. While this "settling" period is started, you can carefully clean the "jar" or case of the battery. Wear gloves, apron, and safety goggles! Use a clean cloth soaked in clear (distilled is best) water. Remove all signs of corrosion and dirt. A small amount of soda may be used for stubborn areas. Remove inter-cell links and soak in soda water. Clean the links and check for pitting or loss of mass. If you find any, it is a good sign the battery cell may be contaminated. Replace any links that have lost any mass or are heavily pitted.

Clean and inspect the cell posts carefully — use a flashlight if you are not in bright light. If you are fortunate to have glass cells, visually check the bottom of the cell for buildup of scale from the plates. If this scale contacts the plates, failure is certain. Remove the cell from service and dispose of it legally. See my article in the June 1994 issue for more detail on legal disposal.

By now, the battery will have settled. Take the electrolyte temperature and

Photo E. These batteries have a spill pan and acid neutralized material on the floor. If you have a large system, this may be a local requirement — be sure to check!

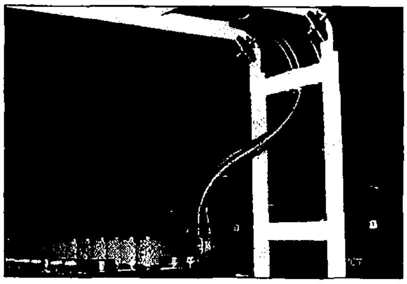

Photo F. A large, well-installed battery bank had the feed cables braced.

record the reading. Now, remove the cell vent caps, take the hydrometer, and pull a sample. The specific-gravity–to–state-of-charge figures will be outlined in your Material Safety Data Sheet. Wear all safety equipment while performing this test. If you do it quarterly, you will be able to discover any cells before they go bad. The next action to take is a load test.

A word of caution here — DO NOT perform a load test on "capture map" or "starved electrolyte" batteries. These cells might be ruined by excessive loads used in this test. Worse, you might start a thermal runaway with disastrous results — so let's leave these types to the professionals.

A load test on a wet or flooded cell battery is no problem. First, set your voltmeter to read the unloaded cell voltage. Then, set a shunt to read the current pulled in the test. So now you have an ammeter shunt to read current, and a voltmeter to read loaded voltage. The next step is to attach your load. I use a huge military surplus rheostat — you can use an auto headlamp with both elements wired to provide a load. I increase the load until the battery voltage drop stops and then becomes steady, and then I quickly remove the load. Be careful — lots of heat can be generated. Simple math and Ohm's law will reveal the inter-cell impedance; write it down. Should this reading increase, your cell may be nearing the end of its useful life. If this seems like too much trouble, garages use a commercial unit to perform these types of load tests. Used units may be available, so it might prove beneficial to call around.

When you're finished, assemble the cells into a battery. The use of nonconductive grease such as No-Ox will go a long way to save time and money in the future. Hopefully, this article will give you at least some of the information you need to keep your battery plant humming along and your station on the air, no matter what. With Y2K around the corner, be sure to get your maintenance done now!

What more data?

Check out these sites:

[http://www.usbr.gov/power/data/fist_pub.htm] — maintenance practice standards.

[http://members.aol.com/bmmsuk/cellcord.htm] — commercial testing equipment.

[http://www.measurebetter.com/products/batacti.htm] — battery tester.

[http://www.avointl.com/products/battery/] — more battery test information.

[http://www.radco.thomas-register.com/olc/radco/radco3a.htm] — automotive battery tester.

Please: Be sure to use common sense and practice safety first. If you don't know what you are doing, take the time to read about battery maintenance. Batteries may appear to be a simple type of older technology, but they can kill you.

Enjoy life off the grid in a safe and sane manner. You may contact me via the E-mail address at top if you like. 73, N7MGT.

A Big Look at Small Wonders' WM-20

This SSB transceiver kit is fun to build and works well.

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I have built many of the transceiver kits on the market. Although I operate mostly CW, I also enjoy working SSB. When I saw the Small Wonders SSB kit, it immediately got my attention. You can purchase the kit with the board and all the on-board parts, or with the optional enclosure kit that includes an extrusion enclosure, 10-turn potentiometer for tuning, on-board frequency counter, connectors, knobs, and controls. The board is only 4.4" x 5.25". The case is not much bigger. The finished product is extremely small and light. This is a very good project for a builder who has experience building kits. The WM-20 board kit costs $100. The enclosure is an additional $60. The kit is available for 40 meters (WM-40) and 75 meters (WM-75). The builder will need to supply an HT speaker/mike. The WM series is designed to be used with the Yaesu MHW-12AB, ICOM M-54, MFJ-284, and Radio Shack HT speaker/mikes. I tested mine with the MFJ-284 and a very old ICOM speaker/mike. I could not detect any difference either on transmit or receive between the two.

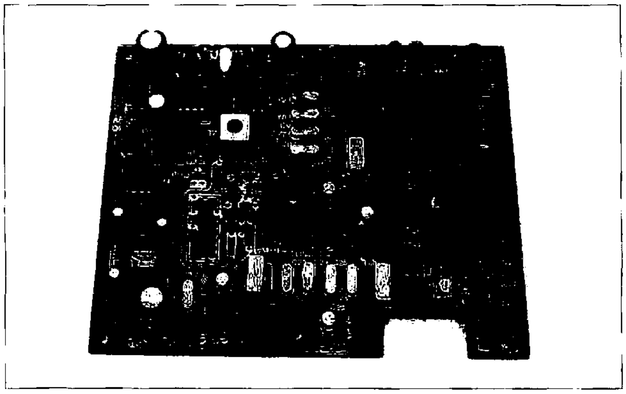

Photo A. The PC board.

The board is a good-quality double-sided printed circuit board. It is quite easy to solder on. The drawback is that with this type of board, it is not easy to unsolder components. If you are careful and follow the directions, this should not present any problem. The only time I ended up desoldering was once I had completed the project and experimented with the transmit section. I used a solder sucker and some desoldering braid. I took my time and did not have a problem.

The parts on the board are densely packed. Some of the parts overlays use the value of the components and some use the part numbers. This is not a problem, but I suggest caution in making sure the correct part gets placed in the proper spot on the board. I used meters and measured all resistors. I also sorted out all the capacitors before I started. I take a sheet of blank 8.5" x 11" paper, stick the capacitor legs through the sheet, and label the values. This makes the building phase much smoother.

I take a few plastic parts trays and sort out the resistors in bunches that are small enough that I can take out my magnifying glass and pick the correct colors. Some builders will sort all the resistors in the same way I sort out the capacitors. I hate spending time doing it this way, and find that if I separate them out this way, I can easily pull the correct resistor while I am building.

The manual is a professional-looking document that has a large parts layout, the parts lists, troubleshooting schematics, a list of things to do before you build, and directions. The manual starts with a circuit description. Dave Benson NN1G designed the rig more for performance than small parts counts. The receiver uses a low-gain j309 RF preamp, diode-ring mixer, and

mixer post-amp. The receiver has automatic gain control. The transmitter chain also uses diode-ring mixers for good carrier suppression and RF stability. There is minimal sharing of transmit and receive circuitry. The manual gives a nice circuit description. The actual building instructions start with general guidelines, such as how to put the diodes in the board with correct polarity, how to install IC sockets, and how to wind toroids.

The kit was designed to be built and tested by functional sections. I appreciated the build-by-section approach. Dave has divided the project up into seven groups. He starts off each section with a blowup of where the section you will be building is on the board. The best part is checking each section before proceeding to the next one. This makes it a lot easier to find any problems as you go along. You build the transmit/receive switching section first. Next you complete the receiver "back end." The next section is the local oscillator and buffer. When you finish the fourth section, you have completed the receiver. The fifth section is the SSB generator circuitry, followed by the 14 MHz driver circuitry. The last section is the final transmitter section. Dave includes a small packet of test circuitry to check some of the sections. This consists of PC board material and some diodes and .01 capacitors. It was fun to build up the little board. This is done on the PC board directly and you build from a schematic. It is a simple circuit and worked well. I checked each section according to the directions and most came up right away in the manner described.

I only encountered one discrepancy with my testing. When checking the local oscillator frequency I found the frequency to be too low. Dave covers this in the manual. As suggested, I removed one turn off L3 to lower the frequency, and then used the trimmer capacitor (C16) to get me right on frequency.

My adjustments for the local oscillator were made easier by the fact that I had purchased the enclosure kit. The kit comes with frequency counter circuitry that installs on the main board. Once these parts are installed, you can temporarily put a jumper (provided with kit) across the "SPOT" header pins. Then, with a speaker attached, you will hear a 3-digit series of Morse code characters. These will be the kHz value of the transceiver frequency. For example, if you hear "212" in Morse, it will represent 14.212 kHz.

The alignment of the transceiver is pretty straightforward. First you align the local oscillator (LO) using the trimmer capacitor. It is easier if you have an external frequency counter or the counter circuitry installed. If not, you can adjust the LO by transmitting into a dummy load and using a calibrated stations receiver. To adjust the receiver, you just peak one IF transformer for maximum hiss. This adjustment was very sharp and easy to do with my kit. Then you tweak two trimmer capacitors (C3, C4) for maximum hiss at the speaker. These weren't as sharp a peak as the IF. There is one

adjustable on-board resistor to adjust the AGC action. You do this by adjusting the resistor for a comfortable maximum audio output while listening to a strong on-the-air signal.

To align the transmitter, you install a test jumper and, while hooked to a dummy load, adjust two more trimmer capacitors for maximum CW power (C29, C21). The best way to do this is using a QRP wattmeter. Next, remove the test jumper and adjust the TX offset by adjusting a trimmer capacitor (C21) for the most natural voice sound, while listening on a station receiver. The manual suggests using a set of headphones on the station receiver so that you can really hear what is going on. The last adjustment is the mike gain trimpot, which you adjust for maximum gain without distortion. I found the whole process to be quick and straightforward.

The only problem I encountered with the entire kit is that with the test jumper installed, I can only get about 1.5 watts CW power out using about 13 volts. I get about 1 watt out using a 12 volt gel cell. All the external controls attach to the board with plugs that slide onto board jumpers. This makes it very easy to put the final controls on and do adjustments and modifications.

When I had the rig about finished, but not in the case and not through a final alignment, I decided to bring it over to my operating bench and hook it up. I placed a piece of paper on top of the metal cover of the tuner it would be sitting on top of in order to prevent shorting of the power. I hooked up the antenna, speaker/mike, and a 12 V gel-cell. The rig came to life instantly. I pressed the "SPOT" button to hear what frequency I was on. I tuned around and found the receiver to be working well. I heard a station just signing off. Using an old technique I employ, I waited until both hams had just signed off and a bit more to make sure the frequency wasn't being used. I then asked if the frequency was in use. I did this several times. The other ham came back to me and told me to go ahead. This was really exciting. I was getting out and could be heard and understood! Still feeling very excited, I gave out my callsign. He came back to me and said my signal was weak, but we exchanged information successfully. Later, I put the case together. This is simply a matter of sliding the board onto rails in the case and attaching the front and rear panels with four screws.

Once I got the kit completed, I waited to have some time to test it out. The next Saturday provided me the opportunity. There was a big international contest on the air. I don't keep track of them, so not sure which one it was. The 20 meter band wasn't great, but it wasn't too bad either. I tuned around for loud signal. I heard a US station and gave him a call. He came back to me.

I had to repeat my information a few times, but completed the contact. I made four more US contacts. That night I got on and heard a station from Hungary. I needed to repeat my call and information a few times, but completed the call.

The front panel layout of the case has a set of mike/speaker jacks, an AF gain control, a spot push-button for the frequency counter, and a tune knob. The back has a BNC antenna connector and the power jack. I wanted to be able to leave the rig attached to the battery and still be able to turn the power on and off. I did not have a replacement 10k pot with an on/off switch, which would have been my first choice, so I installed a small toggle switch on the rear panel. There was plenty of room on the back panel. I simply drilled a hole and cut the power cord inside the rig.

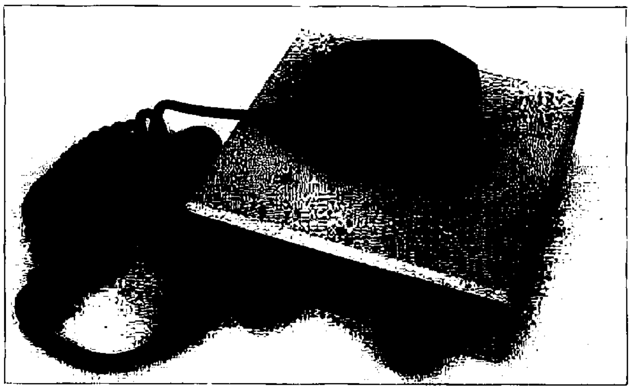

Photo B. The finished WM-20 SSB transceiver.

The entire rig is *very* small and lightweight. It was fun to build and works well. Besides the addition of the on/off power switch,

I would personally like to see a bit more power. I am able to make contacts under good conditions, but the power is just a bit low for reliable use. I believe that in order to keep the rig so small, Dave had some design constraints. I usually like to work as little power as possible.

On CW you can use *very* little power and still make plenty of contacts. I have found that you need a bit more power on SSB to get through.

To test how much difference a few more watts will make in my ability to make contacts,

I am going to do something I have not done before: My next project is going to be to build an amplifier to get the power up to about 8 watts or so.

Specifications

- IF: 9.83 MHz (75m or 40m), 8.00 MHz (20m)
- Tx/Rx crystal filters: 2.3 kHz BW
- Receiver MDS: –128 dBm (0.1 µV)
- Two-tone dynamic range: 90 dB
- Image rejection: 70 dB
- Frequency coverage: 180 kHz nominal (20m, 75m)
- Cold start drift (typ.): 300 Hz
- Transmitter power out: 3–4 W PEP
- Carrier suppression –40 dB: no adjustment required
- Transmitter harmonics/spurs: –45 dBc
- Transmitter IMD3 (2-tone): –36 dB PEP (@ 3W PEP)
- Power requirements: 12–14 VDC @ 120mA (receive), 1A peak (tx)

For further information about this product, contact Small Wonders Labs, Dave Benson NN1G, 80 East Robbins Ave., Newington CT 06111. E-mail: [dave@smallwonderlabs.com].

No Bum Steer

Maximize your loop's performance the easy way.

Howard Shepherd W6US
P.O. Box 607
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The full wavelength horizontal square loop has received good marks from the amateur radio fraternity. When fed with a high quality open wire transmission line, it is an excellent performer, capable of multiband operation (see Notes 1 and 2).

An 80 meter loop gives very good DX on the higher frequency bands, exhibiting gains comparable to yagi arrays. It does exhibit two lobes on its fundamental and an increasingly larger number of lobes and associated nulls as higher multiple frequencies are used.

Quite often, due to physical layout limitations, such lobe and null structure greatly limits good QSOs in desired directions. This article offers a means whereby alternate lobe and null directions can be easily obtained by "steering," regardless of the original physical orientation of the loop.

In approaching this subject, the usual caveats apply — namely the effects of ground topography and the presence of nearby antennas and conducting structures, all of which will alter the azimuthal and elevation patterns described. This information was developed using computer-aided design methods, so because there may be program imperfections coupled with necessary assumptions, the results need to be classified as approximations (see Notes 3 and 4). Despite such warnings, the material presented is, as the saying goes, "good enough for government work."

Refer to **Fig. 1.** The data presented here is based on a full-wave horizontal square loop, resonant at 3.9 MHz. On 75/80 meters, such a loop exhibits a single elliptical lobe pattern with its signal maximums approximately 5 dB greater than its minimums when an elevation angle of 45 degrees is calculated. Obviously, 5 dB are very important on this band, so orientation of the loop becomes a major factor. When the horizontal polarization alone is examined, as distinguished from "total" radiation, the result of changing the feedpoint is much more dramatic, as shown in **Figs. 2** and **3.** The vertical polarization shows a similar pattern rotated by 90 degrees.

The purpose of this article is to suggest how an amateur who is restricted to a given orientation can still "steer" the azimuthal pattern of the loop to maximize the signal in his favored direction. When multiband operation is used, this becomes even more important, as the lobes are narrower and the nulls much deeper.

Fig. 1 depicts a plot plan of the loop. For convenience, and to provide a reference, it is assumed that the orientation is such that the axis A to C is from south to north. As shown, the initial feedpoint is at corner A. The wires are numbered 1 through 4 for convenience in calculation. In this arrangement, the radiation at the 45 degree elevation angle (equivalent to a QSO distance of about 700 miles) forms an ellipse with its maxima through the axis of A and

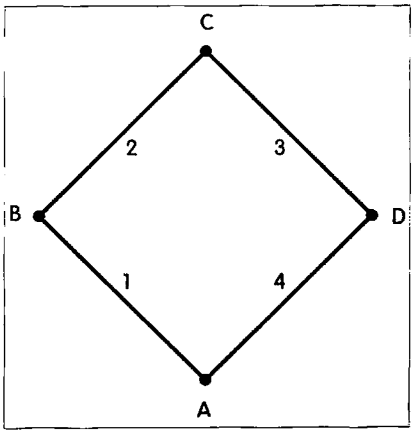

Fig. 1. A plot plan of the loop.

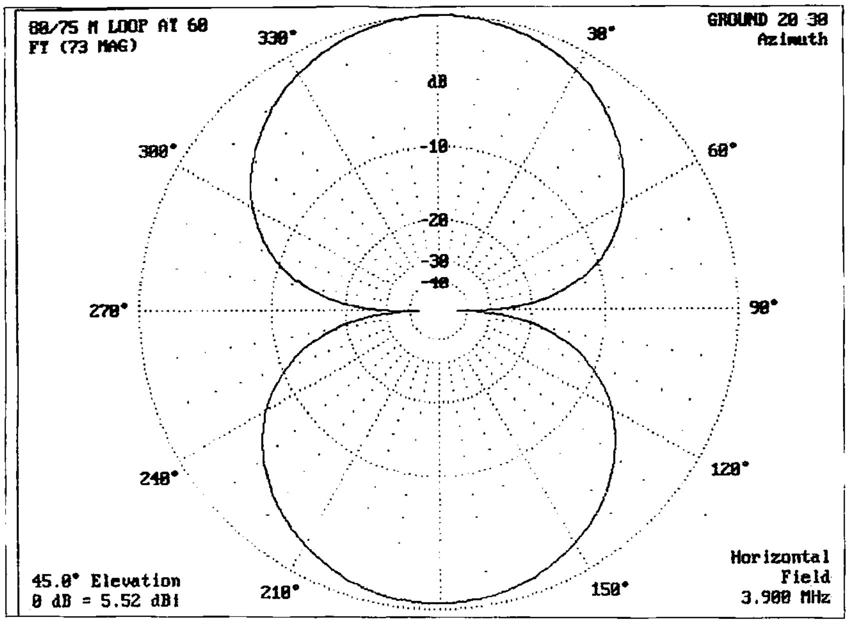

Fig. 2. Loop fed at A or C.

C, and its 5 dB down minima on the axis B to D. In applying this to your own installation you can ask yourself if such a pattern is best for your favored QSO azimuth.

If, for example, you would prefer to have your best distant signal on the B to D axis, this could be easily accomplished by moving the feedpoint to either corner B or D.

Table 1 shows how other intermediate azimuths can be selected by an appropriate choice of feedpoint. While it is true that the beamwidth of this loop on 75/80 meters is quite broad, the principle of "steering" the lobes becomes extremely important when multiband operation on higher frequency bands is contemplated. It does show the latitude of feedpoint selection so as to optimize feedline length while still maximizing the signal in the desired general direction. It should also be noted that placing the loop at different heights above the ground will not change the azimuth pattern, but will

Continued on page 44

Feedpoint	Max. Signal Azimuth (degrees)
A	90–270
25% from A to B	110–290
Center of wire #1	137–317
75% from A to B	160–340
B	0–180
25% from B to C	21–201
Center of wire #2	43–223
75% from B to C	68–248
C	90–270
25% from C to D	110–290
Center of wire #3	137–317
75% from C to D	160–340
D	0–180
25% from D to A	21–201
Center of wire #4	43–223
75% from D to A	68–248

***Table 1.** Other intermediate azimuths can be selected by an appropriate choice of feedpoint. (Refer to **Fig. 1.**)*

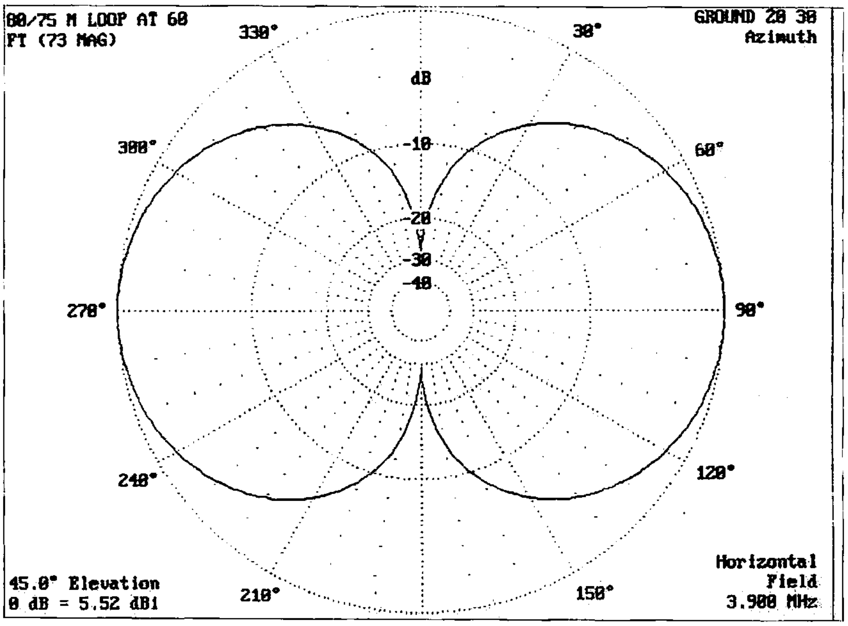

Fig. 3. Loop fed at B or D.

Feedpoint	Main Lobe Azimuth (degrees)	Null Azimuth (degrees)
A	0–90–180–270	57–125–235–308
25% from A to B	36–126–216–308	84–167–267–348
Center of wire #1	45–135–225–315	91–180–273–357
75% from A to B	54–142–234–322	102–183–283–6
B	0–90–180–270	147–214–324
25% from B to C	36–126–216–308	77–177–258–354
Center of wire #2	45–135–225–315	91–180–273–357
75% from B to C	54–142–234–322	102–183–283–6

***Table 2.** Repetition occurs when this 3.9 MHz loop is operated on 40 meters.*

Secrets of Transmission Lines

Part 4: Traveling waves and some thought experiments.

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Pittsford NY 14534

As we move into the area of transmission lines, we will be venturing into a somewhat different mode of circuit considerations. By and large, radios, televisions, and home appliances are made up of discrete components — capacitors, resistors, integrated circuits, and other neat little packages. All are items that can be described in some physical location and all are generally small with respect to the wavelength at which they are working.

Transmission lines are different in that they are described as items having "distributed parameters," meaning that they are not necessarily in one single location. Furthermore, their dimensions are frequently large with respect to the wavelength at which they are working. For this reason the signal properties often vary with the location along the line.

The most fundamental properties of transmission lines were developed in connection with telegraphy; therefore, the general descriptions are referred to as "Kelvin's Telegraphers' Equations." The telegraph was patented by Samuel F.B. Morse in 1840 and the first test line between Baltimore and Washington was constructed in 1843. Western Union was founded from 12 different telegraph companies in 1856, and by 1869 telegraph lines were extended across the continent.

There were three failed attempts to lay a transatlantic telegraph cable, and in 1858 a working cable was laid. It lasted only a few weeks before failing. Even without the electrical failure, the cable was a business failure because of the extreme slowness.

Signal strength was not a problem. The mirror galvanometer invented by William Thompson gave a more than adequate deflection. The problem was that at any significant sending speed, the characters muddled up with one another and became unreadable. It took more than an hour to send birthday greetings from Queen Victoria to President James Buchanan.

At the urging of Queen Victoria, Thompson was made engineer-in-charge of the cable project. His mathematical analysis led to the design of a cable with vastly improved electrical performance. In 1866, Cyrus Field organized another attempt using *The Great Eastern,* the largest ship then afloat. An improved cable connection was completed. This was both a technical and financial success, and Thompson was knighted by the queen

Continued on page 38

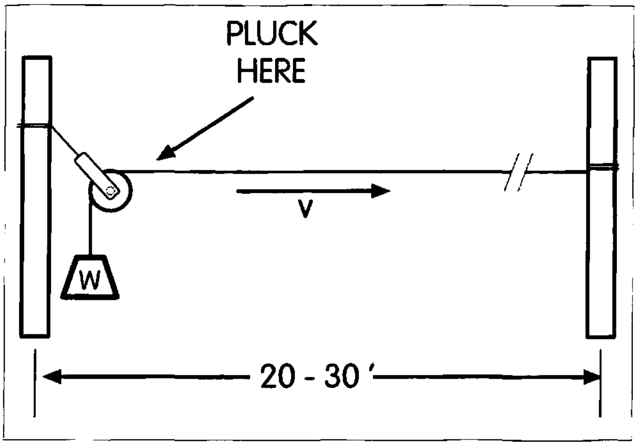


Fig. 1. Traveling waves. Wave velocity is $\sqrt{(T / W)}$ meters/sec, where T = tension in newtons and W = mass of cord in kg/m.

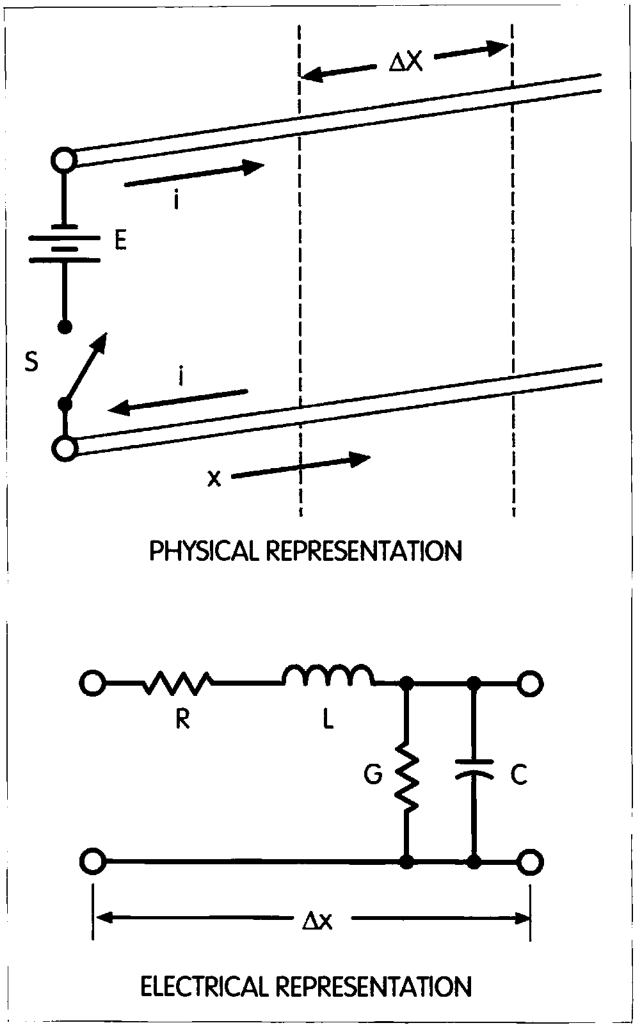


Fig. 2. Physical and electrical representations of an infinitely long electrical line consisting of two parallel conductors. R = resistance in ohms per unit length. L = inductance in henrys per unit length. G = conductance in siemens (reciprocal ohms) per unit length. C = capacitance in farads per unit length.

as Lord William Thompson Kelvin for his brilliant work.

A physical example

In order to give a physical "feel" to some of the work to follow, we will digress for a bit into a physical example. The illustration of **Fig. 1** shows the basic experiment. A cord is tied to a distant solid object and stretched over to another solid anchor point. A pulley is shown here, but it is not really necessary.

A weight is used to apply tension to the cord. The sort of cord used for traverse drapes or venetian blinds, woven cotton about 1/8-inch in diameter, is a good choice. For tension, we would like to have something on the order of 75 to 100 lbs. My auto toolbox weighs about 78 lbs. and worked fine. Support the weight on a box or something while tying the cord in place. Then remove the support and let the weight stretch the cord. Nylon cord does not work well because it stretches too easily. Regardless of the things you have available to anchor the cord to or how you obtain the necessary tension, I would strongly recommend that you actually perform the experiment rather than just read about it.

In the experiment, pluck the cord near the weighted end with a considerable displacement. When you let it go, you will see a "wave" or displacement go flying down the length of the cord to the far end. It will bounce or reflect off the far tree and come flying back to the weighted end, where it will again reflect and head for the far tree. You should be able to follow several transits. The first point is that the cord will sustain waves going both forward and backward. The second point is that the wave will reflect off of the ends of the cord, which are fixed in place and cannot move.

Next take a folded blanket or similar soft article like a sweater and drape it over the cord at the end opposite the pulley. In this case, we have given the wave a mechanism to absorb the wave energy and the reflection will be either absent or small. If an observer were unable to see the far end of the line, he would infer from the absence of a reflected wave that the line was infinitely long. We shall see the parallels to this in an electrical transmission line. If you wish to carry the experiment further, you could try different tensions and establish the fact that the wave velocity is proportional to the square root of the tension and inversely proportional to the mass of the cord.

Remove the damping from the cord and pluck the string in the center. In this case, you will see two waves go flying away; they will reflect off the ends and pass through one another in the center, thus demonstrating that two waves can pass through one another in opposite directions. This may also persist through several complete cycles. When you plucked the cord near the end, the wave portion reflected almost immediately and combined with what appeared to be the single outgoing wave.

Now electrical

Having physically seen some of the transmission line phenomena, let us now try to relate these observations to electrical transmission lines. The illustration of **Fig. 2** shows a physical picture of the line along with an electrical equivalent circuit of the line. In some segment of the line delta x, we have a resistance and inductance in series, and a conductance and a capacitance in shunt. The inductance is due to the magnetic field surrounding the wires following Ampere's law, and the capacitance is due to the electrostatic flux between the conductors. The series resistance is due to the fact that the wires are not perfect conductors, and the conductance is due to the fact that the space between the wires is not a perfect insulator.

Note that in order to charge the capacitor, the current must flow through the inductance and resistance. At this point in the treatment of Kelvin's Telegraphers' Equations, it is usual to branch off into partial differential equations and use a proof, which is actually simpler than the one used by Kelvin, because it uses tools not available to him at the time. However, for

the purposes of this series I am going to present only the significant results using an appeal to rational observation. For those with the desire to see a proof easily available to hams I can refer you to chapter 16 in my book *Antennas and Transmission Lines,* published by MFJ Publishing (#MFJ3305). There are also many academic references available.

Getting back to the example of **Fig. 2**, when we close the switch, what do you suppose happens? With a resistive circuit, we know that the relationship between the voltage and the current is determined by Ohm's law, but here we have an unending string of elements. And consider that even if the line is not infinitely long, it still takes some time for the current to flow from the battery end to the far end before the current can discover what the load or termination is. What determines the current in the mean time? If we simplify the matter by assuming that R and G are negligibly small, the answer to this question is given by:

$$i_f = \frac{E_f}{\sqrt{(L/C)}} \tag{4-1}$$

where
i_f = current in the forward wave
E_f = forward wave voltage

Note that both i_f and E_f can be functions of time. The period it takes the wave to make a round-trip transit of the line E_f in the example is equal to the battery voltage. The subscript f, meaning forward, is something we shall explain shortly.

The term $\sqrt{(L/C)}$ is called the characteristic or surge impedance of the line. It is measured in ohms. It is usually designated as Z_0 and sometimes referred to in speech as "Z naught." It is determined by the physical characteristics of the line.

For example, in the illustrated line of **Fig. 2**, if you were to leave the center-to-center spacing constant and decrease the diameter of the wires, the inductance per meter would increase, the capacitance per meter would decrease, and the characteristic impedance of the line would rise. If you were to leave the wire diameters constant and decrease the spacing, the capacitance would rise and the line characteristic impedance would fall.

This is the impedance that would be presented by a line that is infinitely long. If we remember what happened when we placed the blanket on the far end of the cord, it is also the impedance that would be presented if the line is terminated in a load resistor equal to the characteristic impedance. This resistor absorbs all the power in the forward wave so that there is no reflected wave. It is not possible to determine by electrical measurement the actual length of a line terminated in a resistor exactly equal to the characteristic impedance.

Velocity of propagation

If Z_0 is determined by L and C, it also seems logical that the velocity of propagation should be determined by these same parameters. As a matter of fact, the velocity is given by:

$$v = \frac{1}{\sqrt{(L*C)}} \text{ meters per second} \tag{4-2}$$

In free space, it is possible to separately measure the inductance per meter using current measurements, and the capacitance per meter using electrostatic measurements. The values are:

$$\mu_0 = 4\pi * 10^{-7} \text{ henry per meter}$$

and

$$\varepsilon_0 = \frac{1}{36\pi} \times 10^{-9} \text{ farads per meter}$$

These parameters are usually referred to in speech as mu naught and epsilon naught. If we insert these values into eqn (4-2), we obtain a velocity of $3*10^8$ meters per second, the velocity of light in free space.

In a similar fashion, if we insert the values into equation (4-1), we obtain a characteristic impedance of 377 ohms for free space. This determines the ratio of the electric field to the magnetic

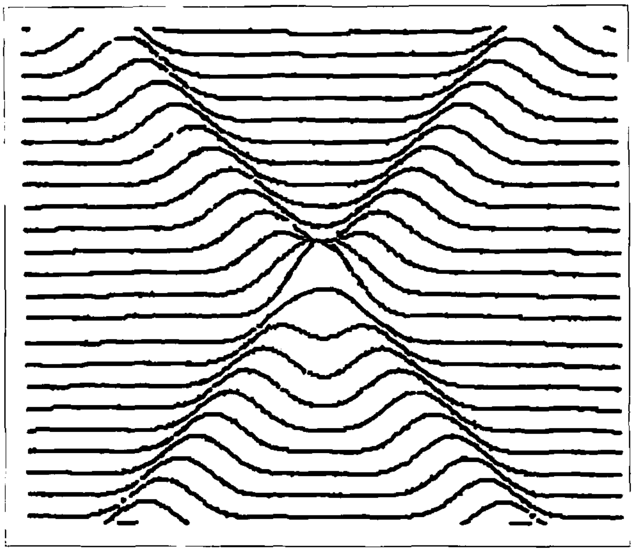


Fig. 3. Plot of the traveling waves: constructive addition.

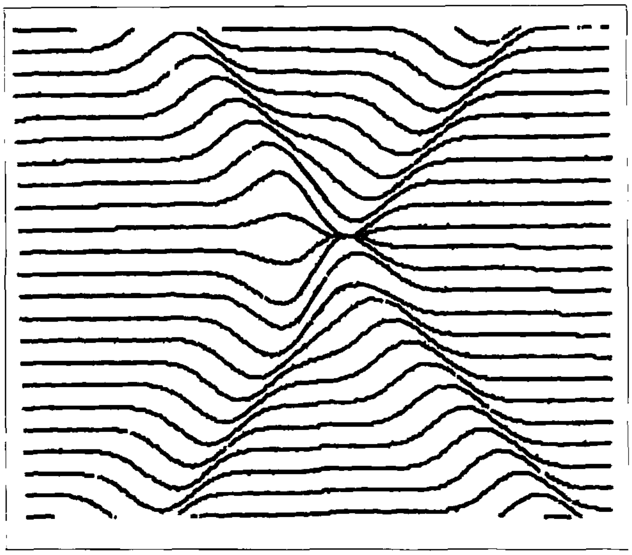


Fig. 4. Destructive addition of two waves.

field in an electromagnetic wave, be it light or radio propagating through a vacuum.

Forward and backward waves

As we saw from our cord experiment, it is usual to have both forward and backward waves on a transmission line. As a matter of fact the actual solution for the telegraphers' equation works out as follows for voltage and current at point x at time t:

$E_x = E_f*[t - (x/v)] + E_b*[t + (x/v)]$
(4-3)

$i_x = (E_f/Z_o)*[t - (x/v)] + (E_b/Z_0)*[t + (x/v)]$
(4-4)

If we use the normal convention that zero is at the left-hand edge of the paper and x increases going to the right, we can do a bit of interpreting of these equations. The term (x/v) describes a period of time. If the wave on the cord were traveling at a rate of v = 1 meter per second, then to travel to a point where x = 2 meters would take two seconds. Therefore, a point 2 meters to the right of the origin would be two seconds behind what was going on at the origin, and the total term [t - (x/v)] describes a wave going to the right. It follows that the term [t + (x/v)] describes a wave going to the left.

From this, the E_f is a forward wave going left to right, and E_b is a backward wave going right to left. Equation (4-4) could have been written with i_f and i_b. However, I elected to use the voltages and the line Z_0 to emphasize the fact that the current is determined by the voltage and Z_0.

A pictorial example

The illustrations of **Figs. 3** and **4** are intended to make the point about the forward and reverse waves visually. For our purposes, I have elected to use the Gauss Error Function for a wave shape. In this example:

$E_f = E_b * \varepsilon^{(-t^2)}$
where ε = natural log base = 2.7183
(4-5)

The Gauss Error Function has a single peak of amplitude one from minus to plus infinity, and it approximates a single cycle cut from a sine wave within a few percent between -2<t<2. Because of the single cycle, it is easier to follow than a sine wave, as we shall eventually see. It is a reasonable representation of the displacement wave in the cord if the cord is snapped out suddenly. The shape is easily seen in **Fig. 3**.

In **Fig. 3**, let us presume that we have plucked the cord in the center. Two waves flee to the ends and are reflected. The one on the left is going right and the one on the right is going left. You can view the successive traces going from top to bottom as separate frames of a movie. As an alternative, you can view the entire picture as a snapshot of two straight-fronted waves in a lake passing through one another at an angle. The latter view benefits from an optical illusion if you hold the book so that one of the wavefronts is nearly in the line of sight. You will note that the waves pass right through one another. At the instant that they cross, the amplitude is doubled, but before and after the crossing, they are unaltered.

In **Fig. 4**, the only change is the fact that the backward wave is reversed in sign; that is, it goes negative rather than positive. The interesting point here is the fact that when the waves cross, they completely cancel at one point, but emerge unscathed after the crossing. In fact, at any instant in time there is only one point that is zero; however, at the point where the deflection is zero, the transverse (up and down) velocity of the cord is maximum. The zero point slides through the two waves.

Conclusion

In the next part, we will amplify some of these concepts to develop the idea of the steady state conditions of the transmission line and the existence of standing waves. 73

The History of Ham Radio

Part 3: 1920–21.

By Eric G. Shalkhausser W9CI, SK

Amateur radio conventions and regional get-togethers back in the beginning 1920s were real festivities. The spirit which prevailed did so imbue all who attended that a broad new enthusiasm was born and dominated throughout amateur radio land in America.

Reference was made in our last installment to the 1920 grand finale convention in St. Louis. To prove that all the big-wigs, as well as hundreds of the hoi-polloi, were present, here is reproduced that convention's "Programme of Events."

It would be to the everlasting glory of the proverbial *Old Man* should any of the sparks of recording effort be transplanted into the pages of amateur history in the future. Probably nothing would surpass the account written in *QST,* February, 1921, pages 9 to 23.

For now, my notebook contains the following account of The American Radio Relay League Convention, as originally written and recorded in January, 1921:

"The Midwest Division of the American Radio Relay League held its convention in St. Louis, Missouri, December 28, 29, and 30, 1920. Representatives from all sections of the country were there, including all of the nine radio districts in the country. Never before in the history of the League has such a successful meeting in the interest of radio taken place. For three days old and young met, in most cases for the first time, although they had known each other for years.

"Hiram Percy Maxim, well-known scientist and inventor, and President of the League, opened the convention with an address. Mr. Stewart, our representative in Washington, outlined the legislative situation, pointing out how the Poindexter Bill recently introduced in Congress is threatening the

Reprinted from *73 Amateur Radio,* May 1977, where this was originally reprinted from *QCC News,* a publication of the Chicago Area Chapter of the QCWA.

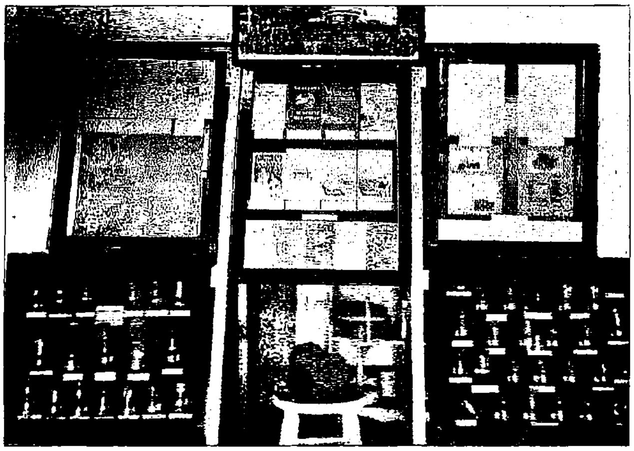
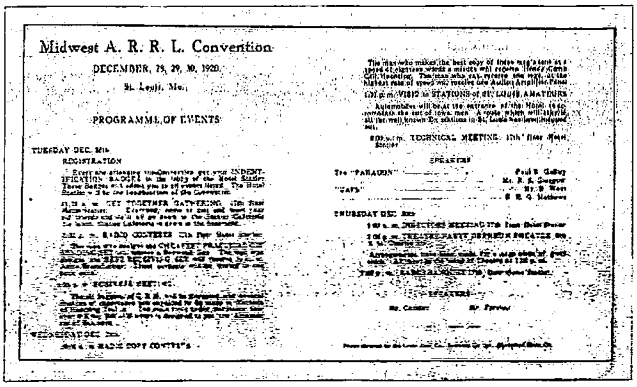


Photo A. *A display of early amateur radio memorabilia now at the Pioneer Village Museum in Minden NE.*



Midwest A. R. R. L. Convention

DECEMBER, 28, 29, 30, 1920.

St. Louis, Mo.

PROGRAMME OF EVENTS

TUESDAY DEC. 28th

REGISTRATION

VISIT to STATIONS of ST. LOUIS AMATEURS

TECHNICAL MEETING

SPEAKERS

THURSDAY DEC. 30th

SPEAKERS

Photo B. *Midwest ARRL Convention Programme of Events, December 1920.*

Photo C. A selection of early vacuum tubes — a far cry from the ultra-miniature transistors and ICs of today.

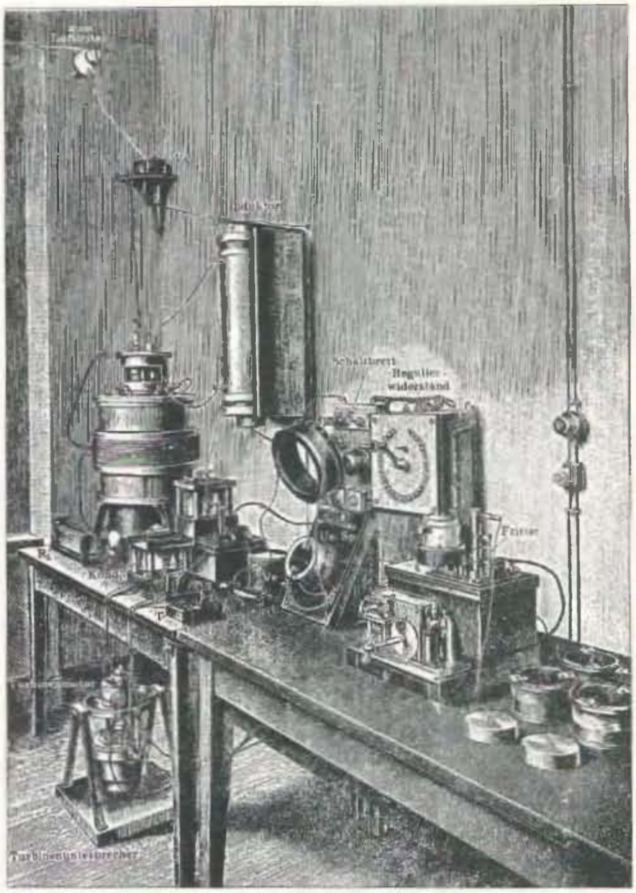


Photo E. The "ideal" amateur station in 1920, consisting of one transmitter and two receivers. One receiver uses an electrolytic detector and telephone set. The transmitter utilizes a mercury interrupter and an open core transformer.

existence of amateur radio operators and experimenters. A committee was appointed to draw up definite resolutions to be sent to Washington protesting against the passage of the bill. Mr. Warner, Secretary and Editor of *QST*, gave a resume of our growth from its inception only a few years prior to the war up to the present time. He stated that membership of over 50,000 has placed the organization in a position where it ranks as one of the largest in the country.

"The technical meeting was held on the 27th. Among the listed speakers were Mr. B. West 8AEZ, naval radio aide and authority on spark dischargers; Mr. Paul R. Godley, chief designing engineer for The Radio Corporation of America; and Mr. R.H.G. Mathews, ninth district superintendent of the League. Topics discussed were in connection with apparatus used in amateur radio stations. Since all amateur stations in the country are restricted by law to operate on a wavelength not exceeding two hundred meters and an input not exceeding one kilowatt, it is essential that all energy put into a set be used to best advantage. The maximum efficiency can be obtained only when apparatus is designed accurately and with special attention to details. The realm of radio is still wide open to improvements with new discoveries continually being made.

"Perhaps of greatest interest was the short but spellbinding address given by Mr. Haddaway, a young man seventeen years old. This lad came from a poor family. As a high school freshman, he had to use his spare time to support the family. He gave us a description of how he made the 'moonshine bulb.' Despite various handicaps, he had built a complete and effective amateur radio station, located in a tiny closet in back of his mother's kitchen. How did he go about accomplishing an 'impossible feat'? Every piece of equipment, including the individual components, were meticulously fabricated out of anything and everything imaginable. Even the headphones and tiny vacuum tubes were homemade.

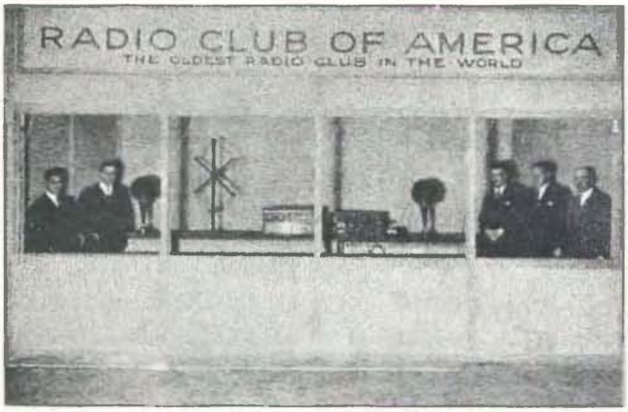


Photo D. Public relations were as important in the early days of amateur radio as they are today. In 1922, a group from the Radio Club of America set up and manned this booth at a radio show in Grand Central Palace in New York City.

He had located a wholesale drug firm discarding waste material and there found scraps of glass tubing, and bits of tungsten filaments from old lamps. With such parts, he made his vacuum tubes. He had built his own mercury pump to evacuate the tubes. He found the mercury from broken thermometers. His headphones were ingeniously fabricated from bits of wood, metal, and wire, but they performed beautifully. Everything else in his station, which was visited during the day, was very cleverly made and assembled. And his only financial expenditure was a 25 cent pair of combination pliers. I have met no one in my lifetime who has displayed such a passionate purpose to succeed.

"The climax of the convention was the radio banquet. To our knowledge, it was the first of its kind ever given in the history of the League. The spirit was there all right! What the St. Louis radio club did not think of was not worth considering. Even the menu savored of sparks and ozone, none of it, however, being charged to very high voltage. Mr. Chandler of 8NG fame, Mr. B. West, and the President, H. P. Maxim, gave short addresses. Bill Wood of the St. Louis club acted as toastmaster. To him as well as to the entire club is due the credit for the overwhelming success of the convention.

"The keynote of the meetings seemed to be *More Unity and More Cooperation* between the various clubs and organization as a whole, in order to be able to stand behind any move which the League attempts to undertake. Every city in the country should have an organized radio club affiliated with the League.

"The ARRL was organized with the intention of relaying messages from city to city, state to state, and ultimately from country to country. Messages accepted for transmission are not charged for. Amateur radio operators do this as a service for the community and for mutual benefit because they have an interest in the development of radio as a ready means of communication. The stations are privately owned and operated, in many cases entailing an expenditure of hundreds of dollars. To be able to communicate with others hundreds of miles away amply compensates the amateur for erecting a station. It affords one of the most fascinating and at the same time educational fields of research to most any person interested in science.

"Radio is indispensable in many of our present-day developments. Steamships and airplanes are lost if they have to do without the services of wireless. On railroad trains and automobiles, its application will eventually revolutionize modern business practices, just as the telegraph and the telephone have done. But to attempt to make far-reaching predictions, not even the most farsighted engineer can come anywhere within the actual facts which will be known ten years from now. [Remember that this was written in 1921.] Too little is understood of this greatest of all discoveries. That we will be able to talk directly with our friend riding in his car in another part of the country seems to be a dream still to be realized."

(End of 1921 written and recorded message.)

To be continued.

Why Not ß-Morse?

continued from page 18

All of these considerations induced me to conceive a new alphabet based on Morse code that I renamed ß-Morse for the following reasons. In the word alphabet, the Greek letter Alpha (α) stands for the first two syllables, and the Greek letter Beta (ß) makes for the last part of the same word . The two first syllables of the word having been rejected for lack of conciseness, the remainder forms, with the word Morse, the neologism *β-Morse* (Beta-Morse).

This alphabet should be a source of motivation for Morse aficionados, as it is contributing to keeping Morse alive and well, at least in the mind of practitioners. It may be used in its handwritten version or eventually in computer software and its multiple applications such as packet radio, RTTY, AMTOR, and so forth. Let me know what you think!

Building a Better Collins

continued from page 23

Can it be that good for only a buck?

This is a foolproof project that is rewarding because it saves big bucks and provides an added feature of interval timing that is far more accurate than the original, heat-actuated relay. If you're thinking this is not true, listen up. Surprising as it may seem, you can improve some things even in a Collins.

If, in our solid state replacement module, the 120 VAC power is removed from the circuit with a momentary shutdown, the full 180 cycle begins again. That is not the case with the tube design. Because of the residual heat remaining within the tube and components, the contacts do not release immediately.

Actually, they remain in the closed position even after power is removed. It takes a considerable amount of time for the metal to cool and the contactors to move apart. I have found that there will be continuity for up to a full minute after removing the heater voltage.

So what's the big deal, you say! The concern is that in certain unusual circumstances this shutdown delay can cause irreparable harm to the tube. If, for example, you required a rapid tube change, it's possible to apply high voltage to the newly installed final without the necessary delay time to get the cathodes up to speed. Even if the contacts opened during the time you were installing the final tube, or you shut down temporarily for another reason, the residual heat within the timer would shorten the delay by a considerable amount.

Unless this timer tube were absolutely cold, you couldn't be certain, with any degree of accuracy, about the length of delay. In that scenario, the wait time would be shortened to a point where the integrity of the tube was at risk. With today's tube replacement cost sky high, you don't need that grief.

It's a win-win retrofit project

The bottom line is that there is no down side to this project, so give my proposal a try. It's cheaper, better, less heat producing, and more ego rewarding than shelling out over a hundred-plus bucks to get the old gal up and running.

If you're a Collins purist and consider this project irreconcilable with your principles, try this approach on for size. Pull your working OEM tube and store it safely on the shelf. Keep in mind that it's an extremely valuable asset with a finite life. Why waste it? Use my timer relay module until you decide to sell the rig or you've scheduled a friend to visit the shack and listen to your much deserved bragging about the details and tribulations of the restoration process. A safe time before the demo, pop in the OEM tube. I assure you no one will know the difference, and I certainly won't tell. Good luck with the project and I'll see you around the Sunday afternoon Collins net (see the March 1999 *QST* for "The Collins Collector Association"). If you hear me in there, don't hesitate to let me know how you made out with the project.

Basic Transceiver Tester

continued from page 27

The primary output voltage ("volume") is controlled by R6 and P3. Both values were chosen because they are convenient ones easily found in most parts bins. I also wanted relatively large values to avoid excessive loading of my circuit. Additionally, realizing that the output of a microphone is relatively low, I chose resistance values that would give me a 10:1 voltage division, making the level setting on a cheap (and more readily available) single-turn potentiometer much easier; with a 12-volt supply, I get a range of 0–1.1 V, and approximately 11 mA through R6/P3.

Final assembly

Most radio manufacturers and/or manuals provide data on how much input is required to a microphone's audio for full signal output, and I set the volume level accordingly. Input and output capacitors to the audio amplifier aren't critical, but are recommended to avoid DC voltage conflicts. To avoid stray RF problems, I put the entire circuit in a grounded metal box, and bypassed all of my incoming and outgoing leads (for which I was careful to use shielded cable).

No Bum Steer

continued from page 36

affect the vertical angle of maximum radiation.

You will observe that in **Table 1**, as you proceed clockwise around the loop from A to B to C and D, and back to A, the same pattern directions as are obtained from A to C are obtained from C to A. This results at the 3.9 MHz design frequency because of current distribution on the loop. Please note that this effect does not occur when this same loop design is used in multiband operation. **Table 2** shows how the repetition occurs when this 3.9 MHz loop is operated on 40 meters.

At this point, consider just what occurs in such 40 meter operation. The following is referenced to 7.2 MHz. You will see from **Table 2** that the ellipse-type pattern obtained on 3.9 MHz is now a four-segment pattern with major lobes at 0 and 180 degrees, and minor ones at 90 and 270 degrees. Also, you gain four nulls at approximately 57, 125, 235, and 308 degrees. The "steering" feature, by selecting different feedpoints, becomes extremely useful, particularly with regard to avoiding a deep (typically more than 8 dB) null in your favored direction. It is interesting to note that with one 7.2 MHz feed, this loop produces only three major lobes when fed at B.

As noted with regard to **Table 1**, the lobes and nulls "repeat" as you proceed around the loop, and for such reason, only half of the feedpoints are shown in **Table 2**. By judicious selection, considering the actual orientation of your own loop, you can again select a feedpoint to "steer" the lobes and nulls for your optimum directions.

This same principle can be applied to 20 meters and higher frequency bands; however, there you are dealing with an increasing number of lobes and nulls as you increase frequency. It

would not be a trivial engineering matter to pick a feedpoint that would satisfy your lobe and null requirements for all bands simultaneously. Confined to 80 and 40 meters, the problem is greatly simplified.

Finally, there is the question of feed impedance. As previously noted, the height of the loop, and its wire size, ground characteristics, and surroundings, all affect the exact nature of the feedpoint resistance and reactance. Fortunately, the use of quality open wire transmission line (not 300 ohm twinlead) and a good antenna tuning unit (ATU) can overcome the matching problem (see Note 5). Good open wire lines can accommodate very high SWR with very little loss, even on long runs from the shack to the antenna. Moving your operating frequency within a band or from band to band will, of course, require a readjustment of the ATU. In extreme cases, a change in length of the transmission line may be required to allow your ATU to accommodate all bands. While these problems do exist, it is believed that the optimization of signals afforded by this form of "steering" is well worth the effort.

Notes

1. DeMaw W1FB, "A Closer Look at Horizontal Loop Antennas," *QST*, May 1990.
2. Fischer WØHMS, "Loop Skywire," *QST*, Nov. 1985.
3. *EZNEC* by Roy Lewallen W7EL.
4. *AO6.5 & NEC Wires 2.0* by Brian Beezley K6STI.
5. M. Walter Maxwell W2DU, *Reflections*, ARRL Pub., 1990.

QRX

continued from page 8

The Commission also amended the rules to eliminate what it called "now-unnecessary record keeping and station identification requirements" that apply only to stations using spread spectrum. The FCC agreed to let SS stations identify themselves using conventions developed by the amateur radio community.

Roanoke Division Vice Director Dennis Bodson W4PWF, who has followed the League's Spread Spectrum initiative through from start to finish, was pleased with the outcome of the proceeding. "I'm very happy," he said. "The League got everything it wanted and more — all of which, I believe, will help to promote this mode on the amateur bands." Bodson served as the ARRL Board liaison with the future systems committee and chaired the Ad Hoc Committee on Spread Spectrum, which was instrumental in developing the League's stance on Spread Spectrum.

Stations employing spread spectrum techniques will remain secondary to — and must accept all interference from — stations employing other authorized modes. The FCC declined to authorize the use of spread spectrum techniques on additional bands or frequencies.

A copy of the FCC's complete *Report and Order* is available at [http://www.arrl.org/announce/regulatory/wt97-].

Thanks to *Harmonics*, newsletter of the South Jersey Radio Association, Sept. 1999.

VCR Y2K

If your VCR has a year setting on it, which most do, you will probably not be able to use the programmed recording feature after Dec. 31, 1999. Don't throw it away. Instead, set it for the year 1972, as the days are the same as the year 2000. Manufacturers won't tell you this — since they are in business to sell Y2K VCRs.

Thanks to *Harmonics*, newsletter of the South Jersey Radio Association, Sept. 1999.

Polarized Sunglasses and LCD Displays

Finally, at the end of the summer, after peering through dozens of scratches in my eight-year-old sunglasses, I decided to purchase a new pair. The optometrist suggested polarized lenses, so I bought them. What a difference — much less squinting in direct sunlight and the glare from reflected light is dramatically reduced.

However, I soon realized that I wasn't exactly looking at the world as I had been accustomed. Many rear and side windows of cars now take on a strange checkered pattern. Some windshields on oncoming cars are now a deep, almost iridescent, blue-violet color. And at times, depending on lighting conditions, portions of the road surface appear to be raised into an exaggerated 3-dimensional form. The windshield on my Goldwing is no longer clear — it has now taken on a multicolored rainbow tint, limiting my closeup view of the road. This instant change has been somewhat of a psychedelic experience for me, but the glare reduction and comfort of the new polarized sunglasses has been worth it.

However, the biggest problem associated with wearing these new sunglasses is when I try to read the displays on some of my mobile transceivers (Standard C5718DA, FT-900, Radio Shack SWR/Power meter, and Alinco DJ-599). The backlit liquid crystal displays on this equipment become difficult to impossible to read, depending on lighting conditions. Tilting my head to one side improves the situation a little, but when driving (especially in public view), I usually refrain from tilting my head to one side until my ear touches my shoulder.

Here' a bit of information about polarization of light.

Polarization is one of the fundamental properties of light waves. It was discovered in 1808 by E.L. Malus, a French army engineer. He was fascinated by the optical properties of the crystal calcite and frequently carried a piece with him to demonstrate its properties to his friends. One afternoon, while looking through his crystal at the windows of the palace of Luxembourg, he noticed that the image changed as he rotated the crystal. He could not explain his observation but actually had discovered that light was polarized by reflection.

The principle of a polarized lens is best illustrated by observing the use of venetian blinds. The blinds block light at certain angles, while allowing light to transmit through selected angles. True polarization is achieved by shutting out 100% of undesirable light and allowing 100% of desired light through.

Light striking flat surfaces, such as water, snow, glass, or pavement, is reflected perpendicular to that surface. This reflected glare or polarized light is much more intense than normal sunlight, irritating your eyes and inhibiting vision. Polarizing lenses have the unique ability to selectively eliminate glare. Through the horizontal alignment of polarizing micro crystals, these lenses block all vertical light, making polarized lenses particularly suitable for water sports, cycling, and driving.

Polarized lenses have been used in over one billion pair of sunglasses over the last 50 years and their use remains widespread today because they have a clear functional benefit for the wearer. Polarized lenses are the best way to eliminate both bothersome glare and dangerous UV light.

Any pilots among us must beware of using polarized lenses in aircraft. Most aircraft windows are made of multiple layers of plastic. When viewed through polarized lenses, distortions and stress areas are visible — which can be distracting and dangerous.

The LCD displays on our radios emit light that is polarized. Apparently several of my radio displays emit vertically polarized light, and my new sunglasses do an effective job of blocking this vertically polarized light, making the displays nearly invisible. I suggest that before you decide whether or not you want to have to deal with the effects of polarized lenses while driving and operating your ham radios, you should ask your optometrist if you can take a pair into your vehicle and give them a try.

Thanks to author Mike Stone N1VE; reprinted from the October 1998 issue of *The Communicator*, the monthly newsletter of the Central New Hampshire Amateur Radio Club.

Number 46 on your Feedback card

Above & Beyond

VHF and Above Operation

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Microwave 10 GHz Contest preparations — Considerations for portable operation

This last weekend in October was the ARRL 10 GHz and up microwave contest. I had to scale back on my participation due to a recent knee injury that prevented my full involvement. However I was still able to operate on 10 GHz from my home location and made several contacts, keeping my feet wet and in the game. Only made a few contacts with an omni antenna at 10 GHz at the home QTH, but had lots of fun listening to liaison contacts being set up here in Southern California.

I have to credit those who packed up all their microwave gear and took it on a traveling expedition to great hilltop sites in this last ARRL 10 GHz contest. If you have never operated portable microwave, you are missing an opportunity for a lot of fun in the sun, at least here in Southern California. But, sure, there are lots of things to set up prior to a hilltop expedition to make the trip a successful venture.

Microwave being what it is, operation from a high spot in the clear means packing quite a bit of equipment up to this semiremote high point for good microwave contacts. Not only does your converter have to function well, but there are so many other aspects that need attention to ensure a good trip.

First and foremost, for portable operation you need a good source of power. Normally, remote power is derived from 12 volt batteries. In some cases, several are connected in series for 24 volt operation when commercial TWT amplifiers are used for high output RF power in the 10 watt and above range. These TWT (Traveling Wave Tube) amplifiers' normal DC power requirements are set up for either 24 volts or 48 volts DC. Needless to say, at 48 volts that's a lot of 12 volt batteries to haul around to a remote site — making 24 volt operation a little more desirable.

The batteries for reliable operation normally sit around for a year unless you have other uses for them on noncontest weekends. This means that a complete checkout of battery capacity should be done to ensure that your batteries will not fall flat after a few hours of use. Normally, batteries with a capacity of 25 to 30 or more amp-hours are required, allowing you at least 10 to 12 hours of operation before recharge is required. On such a battery stack for 24 volts, you have power taps at 12 volts for 2 meter liaison power that on transmit draws several amps for high power rigs to 2 watt HTs that draw little on the battery current budget. Add to this the 24 volt TWT current of 2 amps in standby and 5 amps in transmit, plus the power required to run the microwave converter, and they all add up fast. Usually, with a TWT amplifier there is little thought of backpacking in a rig, as the weight of batteries required make the trip an expedition rather than a trip to a hilltop site via automobile.

The current budget can be reduced quite a bit by using a solid state amplifier, reducing current consumption and still allowing for 1 watt of RF power from solid state amplifiers. Backpacking to a high spot can be accomplished, as a battery of less weight and amp-hour capacity can be employed.

In either case, don't just charge your battery to get ready for remote operations. Rather, charge the battery and then hook it up to a dummy load resistor or even a string of automobile headlamps, to check the capacity of the battery you intend to use. Make readings of terminal voltage under a constant load, plotting just how much current is available from the battery under test. As you know, headlamps make a good test, as they will deplete your car's battery if left on. Don't go out and purchase headlamps; instead, check with your local service station for old ones that have one lamp burnt out — they will work fine for our application.

I had an old, low-capacity YUASA 17 amp-hour battery that showed 6 amps or so of usable capacity. It would charge but was a soft battery for use. I left it for HTs and other low current uses. However, the story changed when I purchased a used garage sale Power Wheels battery-operated low-speed kid's toy truck that our grandchildren could sit in and ride. It was missing the batteries (2 each 6 volts). Considering the form (size of battery required) factor, only the soft YUASA would fill the bill for use in this truck. Sure enough, the kids drained the battery in short order, and I recharged it again and again after each use. They had lots of fun, and I learned a time-proven lesson again.

After each recharging I noticed a very distinct change in battery life, and after the third charge/discharge cycle over two days' worth of use, the battery returned to its nearly 17 amp-hour capacity rating and did not show any signs of being "soft" anymore. This is not a NiCd but rather a gelled sealed battery. Don't know if this is normal for gelled cell batteries, but it changed my evaluation of batteries and the charging methods to use. Considering that we normally are working with used batteries, it's worth a shot to see if any improvement in capacity can be attained.

Another good battery-related tip is to avoid clip leads for connection to your battery backs. While the clip leads work well, there is an inherent danger in connecting them up with reversed polarity and inflicting damage to your converter or the HT used for liaison. Use a standard connector decided upon and make that connector your battery connector. Use it on all DC requirements for 12 volts. Select a separate connector for other requirements such as 24 volts.

I use a three-contact connector for 12 volts (one pin no connection) and a four-contact connector for 24 volts (2 pins no connection) to prevent them from being cross-connected. It has saved a serious problem from happening due to reverse polarity and wrong potential power problems in the field. Check out your wiring in the shack at your leisure, and in the field it will not be in error even under panic conditions, as only the correct connector will mate to proper power.

Converter operation is also an item to check. How well is your receiver operating, and do you get rated power out of your transmitter? Simple checks in the home shack can be made ahead of time to prevent trouble in the field. Verify it and don't depend on how the rig operated last year. I have found even the venerable SMA connector or good-quality adapters in the RF path to show up after years of use as quite lossy. Some of the problems showed up in coaxial relays that failed a simple ohmmeter continuity check. Shake and bake is not just for chicken! For improved microwave enjoyment, use the technique for your rig's checkout before going to a remote hilltop.

Also, use a good-quality heavy tripod for your dish antenna

system and mount a compass rose even if you have to make one on a copy machine and mount it on stiff cardboard to allow your pointing in a calculated direction. This simple tool will greatly enhance your operating skill level and help you aim your antenna more accurately for distant stations.

Seek the high ground, as while microwave does reflect off objects, it provides the best performance when operation is in the clear, high above foreign objects, buildings, and green foliage. Trees and other similar "green" foliage plants make great attenuators and as such are counterproductive to microwave energy. While shots can be made through trees and high bushes, they are still a good microwave absorber and attenuate our signals, making contacts quite difficult. Whenever possible, set up in the clear and avoid trees.

I should take my own advice and not shoot through trees, but this was not the case for my participation this contest weekend. Being unable to load a dish and carry the batteries needed for portable operation, I attached an omnidirectional waveguide antenna in midtree, perched on a long stick and lashed to our kids' tree fort in our back yard, and was successful in working several stations on 10 GHz. Part of the success was because I was running 10 watts of power. Even with this power level I was able to only work local stations. The trees where the antenna was perched proved again to be very lossy and prevented me from working more distant stations.

First and foremost, make checks to verify your microwave transceiver prior to venturing outdoors. Several weeks before anticipated operation, get together with a buddy and check out your rig. Your shack is very forgiving to needed repairs and offers all ranges of tools and test equipment to do needed adjustments or repairs. Don't get caught using a rig that has been sitting on the shelf since last year's contest. Check it out and verify its operation and performance under actual contact conditions.

The San Diego Microwave Group meets a month before contest time at Kerry N6IZW's home, where we all re-evaluate our microwave rigs to ensure that they rigs are operating at peak performance. We verify not just the rig functions, but that power output and dish, feed, and transmitter power are all in good alignment. We use a system that provides readings of detected power at a remote site some 100 feet distant. This antenna/rig test range is quite simple, and is nothing more than a small antenna coupled to an RF switch for both receive and transmit tests. In receive, we compare the station's ability to detect a low power signal source used to simulate a 144 MHz drive source, and vary the generator's power on transmit to the remote simple converter and determine minimum detectable signal strength on each 10 GHz rig.

This scale is charted out to accommodate different antennas' gains and such to make all different setups/antennas used, etc., fit on this equalized playing field. We calculate the differences between calculated gains of the antennas used to expected power output so that the final number crunched out relates to a total system quality factor. In practice, for receiver testing each system is set to detect a remote transceiver for which we control the drive signal to arrive at a minimum discernible signal level. We then figure in the antenna gain and other factors to see if this system is performing as well as it should.

Considering the antenna gain and preamp noise figure, we can compare all rigs to each other by this minimum received discernible signal level. This is related to the 2 meter drive required to produce a low output signal at the test transmitter used for these tests. Receiver problems show up quite easily if there is a sensitivity problem. In actual tests, we were able to set all tested receivers to within 1 to 2 dB of comparison performance specs, allowing for antenna differences (after several rigs included some toughening up to improve performance).

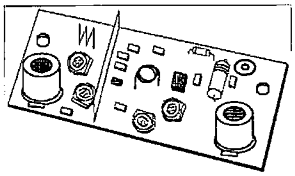
On transmit, the remote is now a receiver, and we measure detected 144 MHz (the IF signal) power on a power meter and derive actual recovered total system transmit performance. If the power recovered at the remote receiver is low, the transmitting system needs some attention. The fault could lie in several areas. There could be a dish that is not being fed properly, or trouble in coax relays or connectors, or even low performance amplifiers for output power. Each element needs some attention to determine where the performance improvement can be made to bring the transmit system to proper operation. Again, allowances are made for power output and dish size in comparing all stations tested. Test your station and determine if it is operating at peak performance before you venture out to a remote site. Trouble-testing your systems before going to a remote hilltop location is a very prudent step to ensure good system operation.

Last and probably most important is to take care of your comfort on a remote hilltop. Bring a chair and clothing to match unexpected conditions. Always overstock on liquids, sunscreen, and even a hat for your enjoyment. Bring several pencils or pens as you prefer. If you have room, use a clipboard to hold your logging notes and other contest-related notes, plans, maps, and schedules.

Most of all, be prepared for a great experience — hilltopping on microwave. Set up early, check out your equipment, and have a great time making contacts. 73, Chuck WB6IGP.

Number 48 on your Feedback card

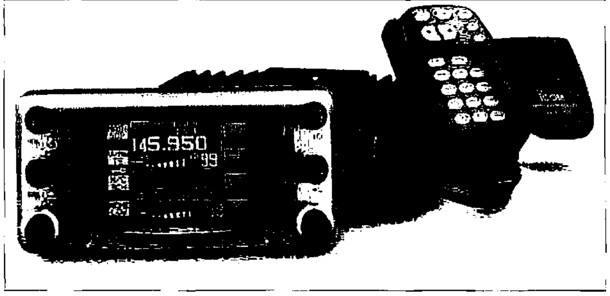
NEW PRODUCTS



Hamtronics Low-Noise Receiver Preamps

Now you can hear the weak ones, too, and without spending a fortune! Hamtronics' LNY series of preamps, which replaces the LNW, uses a new low-noise MOSFET specifically optimized for best performance at VHF and UHF frequencies. The FET has built-in diode protection and very low feedback capacitance, resulting in good stability and rugged performance under a wide range of voltage, signal, and load impedance conditions.

The PC board is only 1 x 2-1/2 inches, and the unit operates on +12 to +15 VDC at 10 mA. Models are available for all popular bands from 28 MHz to 470 MHz. Factory wired and tested, $29 each. For further information, contact Hamtronics, Inc., 65-D Moul Rd., Hilton NY 14468-9535; tel. (716) 392-9430; fax (716) 392-9420; E-mail [jv@ham- tronics.com].

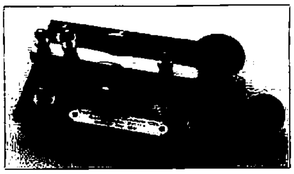


ICOM's IC-2800H

The IC-2800H dual-band FM transceiver has a unique full-color LCD display with user-selectable modes and video capabilities. But it's not just pretty. With durable construction, installation flexibility, a bandscope function, 9600 bps packet, independent tuning controls, convenient memory editing, and more, it offers advanced functions, convenient features, and superior performance.

The control head for the IC-2800H measures 5.5W x 2.75H x 1.3D inches, while the main unit can fit under a car seat, at 5.5W x 1.6H x 6.6D inches. The IC-2800H transmits 50 W on 144–148 MHz and 35 W on 430–450 MHz.

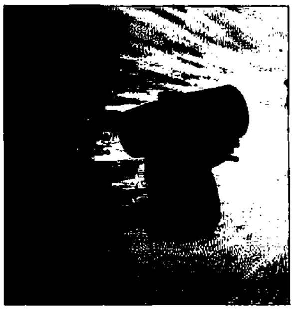
For further info, contact ICOM America, Inc., 2380 116th Ave. NE, Bellevue WA 98004; tel. (425) 454-8155; site [www.icomamerica.com].



Tippecanoe Model ZK-1 Key

Robust as well as functionally beautiful, the Tippecanoe ZK-1 is reminiscent of the type of hand key found on British navy vessels. Two knobs are provided — the flat topped for traditional styling and the round topped to reflect the British heritage. You may find that during extended operation, switching between styles can help to reduce hand stress and fatigue.

Features include 3/8-inch-thick black granite base; solid brass key arm, pivot, and adjustments; stainless steel ball bearings; bronze lock washers; ceramic knobs; and silver-plated contacts. Measurements: 4W x 6D x 3-1/4H inches; wt.: 3 lbs. For price and further information, contact Tippecanoe Radio Company, PO Box 321, Tipp City OH 45371; tel. (937) 667-9399.



Nighthawk Microlight II

Wavesure, LLC, of Greenwich CT is proud to announce its release of the totally re-designed Nighthawk Microlight II. It is now available in five (5) *new* LED colors — white, green, red, amber, and infrared — thus making the new Nighthawk Microlight II one of America's best and most versatile hands-free illumination devices on the market today.

The Nighthawk Microlight II incorporates design, function, and reliability into this next generation product. It is constructed of high impact polycarbonate resin and is designed to be worn on any finger or hat ... your choice (via a Velcro strap or accessory clip, respectively). It is so small and lightweight (it weighs approx. 1/10 of an ounce) that you don't even know you are wearing it. The Nighthawk Microlight II is so bright you will wonder how anything so small can generate this much high intensity light. It is powered by 2 x 1.5-volt button batteries that give you a continuous burn time of 15 hours.

The original Nighthawk Microlight had been used by US military pilots for over 15 years while flying night sorties. The pilots use this device to illuminate their cockpit controls while wearing night vision devices. The Nighthawk Microlight II uses the same technology as the original, but only this time it has been built for more everyday use.

Three years ago, the principle of Wavesure, LLC, Mr. Keith Lucas, brought this unique product to the consumer market. Since then, the Nighthawk Microlight and the Nighthawk Microlight II have found multiple applications in the marketplace, including uses in the boating, fishing, camping, hunting, flying, theater, photography, astronomy, auto repair, DJ, airline maintenance, emergency, and law enforcement fields, just to name a few.

It truly is an invaluable tool at work, at home, or at play. They say that "Next Generation Products" is not just their logo, but also their mission! Prices start at $17.99.

For more info, contact Wavesure, LLC, PO Box 31237, Greenwich CT 06831; tel. (888) 650-3345; E-mail [info@wavesure.com]; Web site [www.wavesure.com].

Number 50 on your Feedback card

On the Go

Mobile, Portable and Emergency Operation

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Palm Bay FL 32907-1371
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Floyd interrupts the routine

By its very nature, emergencies are successfully managed only by having redundant capabilities. Likewise, we always have the need to use resources in an emergency that we may not use during ordinary times. A fire extinguisher sits on the wall receiving little or no attention during ordinary times, but is quickly retrieved and used when smoke or flame is noted. This same situation exists among ham radio operators during emergencies. Our very services as communicators are not relied upon during routine situations, but become critical when Mother Nature or other forces interject their effects into everyday life.

I was thinking about this the other day when Hurricane Floyd was in the news. Here in central Florida we were at risk of winds of up to 150 miles per hour if Floyd had followed the track that it was projected to take. Winds at that speed can evidently flatten a cinderblock and stucco home as easily as a woodframe structure. Fortunately for us, the storm turned and did manage to lose some of its power before clobbering the Carolinas. In preparation for the storm, amateur radio operators were covering the public service agencies, hospitals, shelters, and the National Weather Service.

Now, the station at the weather bureau is great. There are two VHF rigs — one on a vertical, and the other on a beam. There are several computers at the operating position, one of which can operate APRS, another of which shows the display of the NWS radar system. The station even has the perfect call—WX4MLB (MLB being the airport designator for the Melbourne, Florida airport where the weather station is located). This station has been well thought out and well supported by both the Weather Service and the ham community, and could serve as a model for other facilities. Yet when facing an event like Hurricane Floyd, I found that redundancy was the name of the game.

Naturally, when I first arrived at the weather bureau I set one of the 2 meter radios onto the network frequency for disaster services. We had decided that until events dictated, we would utilize a single frequency rather than have SkyWarn on one and disaster services coordination on another. I set the other radio to APRS, which utilizes a packet terminal node controller (TNC) and displays a map indicating station locations; since some of the APRS stations have weather reporting systems, I thought this might be useful. For something as large as a threatening hurricane, the weather reporting was not as useful as in other situations, which was just as well. The weather problems began to build in a manner where they threatened the counties to the south, so I switched that rig to their SkyWarn frequency and monitored the hams to the south.

Naturally with a large storm and adequate warning, evacuation may be advisable. The county mandated evacuation for the barrier islands and, given the potential for damage, many people elected to head for higher ground further inland. As the major roads and interstate highways began to clog, we found the need to stay in contact with disaster services stations to the north and west. I was requested by net control to establish contact with the Orlando area net. This meant swinging the beam from the south to the northwest and getting on Orlando's frequency, and using the vertical to keep in touch with the stations to the south. My personal handie-talkie then became the link to the local network. Naturally, I had brought my "Grab and Go" bag with me, and I had the HT set up with a 5/8-wave telescoping antenna in the desk charger with the speaker mike.

Now, as you might expect, with three radios operating simultaneously, things can get a bit confusing. The nets in Orlando and the Treasure Coast net in the counties to our south were handling traffic that was not always of interest to the weather service or disaster services.

I decided to connect an earplug to the HT tuned to the local net so that I could focus a little more closely on the local situation. This was also helpful because there was a fair amount of extraneous noise as the weather forecasters tried to perform their duties — especially when they held periodic conference calls with other weather stations in order to determine the best information for tracking the hurricane.

So in a very well-equipped facility, I had already begun to employ a fair amount of my own gear on top of the gear that was already on site. As I said, redundancy is the name of the game in an emergency! Perhaps this became even more obvious to me, because a few weeks before Floyd reared his ugly head, I had lost the display on my Kenwood TH-79A. Now, I really love this radio and think that it has many fine features, but the display has gone out on me twice, and both times were at the height of hurricane season. Fortunately, the unit had gotten back from repair a few days earlier and was available. But what if it hadn't?

Well, no true ham needs much of an excuse to obtain one more toy. In my case another in a seemingly endless succession of birthdays occurred and the YF (I still prefer that to XYL) bought me one of those new miniature-size HTs. Many manufacturers are offering these small units — mine happened to come from Radio Shack and is their HTX-200. While I prefer to have a higher power output available, I have been greatly surprised by this little unit. The 200 mW available when operating using the two AA cells is adequate to bring up the local repeaters with full quieting. It is possible to plug in an external power supply, too; a 9 volt power supply will boost the output to 2 watts.

The unit has 30 memories that store frequency, offset, and CTSS tone (as well as a receive tone if desired.) It is truly shirtpocket in size (2-1/4" x 3-3/8" x 1-1/16") and weighs only 4.2 ounces (plus batteries). In order to keep the size small, it lacks a few things such as a DTMF keypad, and the display may be a little small for some. My solution was to program everything in good light while wearing my reading glasses so I wouldn't have to mess with it under field conditions.

During Floyd I used this as my portable unit while the Kenwood acted as the third desktop unit. This allowed me to be reachable (or at least monitor traffic) while stepping away from the operating position for a bite to eat, a cup of coffee, a breath of fresh air, or a restroom break. For everyday use, this fits comfortably in my briefcase, so I always have an HT with me. Some radios are just plain fun as well as useful, but then this is a hobby, after all.

QRP

Low Power Operation

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Even though the HW-8 I had just purchased looked very good, it was in fact as dead as you can get. There is no audio, no sidetone, and no static coming from the headphones. However, if you keyed the transmitter, it did produce a good 2.5 watts of RF. Knowing that the transmitter did in fact fire up meant a lot of things.

Start out by looking at the stuff that works first

Since the HW-8 is a direct conversion design, having the transmitter meant that the local oscillator, the VFO, and heterodyne oscillators were all working! With the aid of my frequency counter I could tell that the bandswitching scheme was in fact working, as each band was on frequency and stable. All the bands produced an output except for 20 meters. That band was really dead: no transmit! Since the HW-8 uses switching diodes to select tuned circuits and for selecting the proper crystal used in the transmitter, a good bet would be a bad diode someplace. But, for now, the problem at hand was getting something to come out of the headphones.

Remember a few months ago, when I mentioned I had assembled a Ten-Tec universal audio amplifier kit? Well, that little guy came in hand very nicely while troubleshooting the HW-8. Since all the RF sections were operating, the trouble should be someplace in the audio chain. There's a chance that the reason for a dead receiver may be the RF stages of the receiver, but since there is no audio, I'll let the RF section sit for a while.

Since a direct conversion receiver gets 99 percent of its gain at audio frequencies, it's easy to pick up some of this audio as it moves from the mixer to the headphones. In the case of the HW-8, there are several stages of audio gain along with a section or two of audio filtering. The sidetone is also injected in this audio chain. Since we have no sidetone, the problem must be after the tone is injected into the audio amplifier. I used my scope to take a peek at the output of the sidetone generator. Sure enough, the HW-8 was in fact producing a very nice and strong sidetone when the key line was closed.

Most of the audio generated by the receiver section in the HW-8 is very low level. There is a small PC board supported by a single mounting screw and standoff on the right side of the chassis. This guy is the audio power amplifier! Using the Ten-Tec audio amplifier, I had audio going in, but nothing going out. Hmmm. Sounds like there is something kaput on this PC board. After taking some voltage readings, to make sure that VCC and ground were in fact available to the board, the likely suspect was a single transistor.

Heathkit has always been known to use semiconductors having odd pinouts and strange part numbers. So, without missing a beat, I stuck in a transistor I had in the ol' junk pile. Fired the HW-8 up and whoa! There be static in the headphones! Oh, yes: Remember, if you ever pick up an HW-8, or HW-7, the audio output is designed for high impedance headphones! Those walkthing headphones won't work with the HW-8.

Hearing signals once more on 40 meters from the HW-8 can produce a case of the warm fuzzies. However, those soon cooled off as I tried to get 20 meters to come alive.

A dead 20 meter band

The 20-meter band did not produce any RF into the dummy load. Once the audio problem was fixed, I expected to hear signals on that band, too. Alas, nothing but some static.

Because the HW-8 uses the VFO to produce many of the signals required, it's easy to check out the receiver and transmitter circuits with only a general coverage receiver. All you need to do is tune your general coverage receiver to the frequency display on the HW-8's VFO. You'll be able to hear a steady tone produced by the HW-8. You can increase the signal strength of the VFO circuits by draping a wire connected to the general coverage receiver close to the VFO can inside the HW-8. Just be sure you don't allow the wire to touch the VFO variable capacitor. Doing so will cause the HW-8's VFO to shut down.

With your general coverage receiver tuned to the VFO's frequency, you should be able to hear it quite loudly. You may have to tune the VFO up or down in frequency to hear the beat tone. The HW-8 is not known as a frequency standard, and the VFO will more than likely be off frequency. It only takes a few minutes to tell if the correct signals are being generated by the HW-8. In my case, everything was there except for the 20-meter band. Nothing was heard in the receiver, so a more drastic approach will be needed to track down the problem.

As I mentioned earlier, Heath uses switching diodes to select the proper tuned circuits and crystals used by the HW-8. The

THE DIGITAL PORT

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Carson City NV 89702-1792
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You may wonder, as I did, about the real acceptance of PSK31. Just a little over a week ago (during September), a 24-hour contest was staged for the new mode. Several interesting things became apparent.

The first point of interest was obvious to me when I only accidentally ran across the listing of the contest in *QST* during the week previous to the contest. Surely there were other notices because the activity was there in full force, but I only saw the one.

I admit I am not a contester — and, I want to be perfectly clear, this is only because it is a skill I have never developed. However, I do admire those who participate and do well. For me, it is a bit intense — I don't do well with handheld games either.

But I did listen and make a few contacts (seven of them). By Saturday morning, I heard stations that were reporting in excess of 300 contacts. I was impressed. There were stations from Europe, Asia, and South America, and I worked a few of them with my little peanut whistle signal.

I noticed some big gun signals. It seems that the norm for those running power is about 200 to 300 watts. Some may be a bit "louder." However, the saving factor with PSK31 is that it is an excellent weak signal mode. All that is necessary is for the receiving station to tune carefully. Many signals that do not wiggle the S-meter are 90 percent readable or better.

I managed a solid contact with JG1GGU, and my signal was heard by OA4CVT, but the info exchange wasn't good on the latter and he moved on. I was just glad to be heard. The most interesting station I heard was BV2B. He never heard me, but it was a thrill to hear the signal from China and know that interest in the mode is alive and well there also.

Another new toy

I received an E-mail from Bill N5ALO, who pointed me toward the PSKGNR software that works with the original PSK31 software for Windows™. The package is conveniently set up to be downloaded to two floppies for easy transport. The Web site is [http://www.al-williams.com/wd5gnr/pskgnr.htm].

I downloaded it and printed the manual, and it is a delight in several ways. Installation is easy. It takes care of itself in that you put it in a separate directory, click "setup," and it jumps through all the necessary hoops. When it is finished, you just keep following directions to run the program and install your callsign.

The part that sounds scary to me is that this is a front-end for the PSK31, so both Windows programs are meant to run concurrently. When you boot the PSKGNR, it hunts for the PSK31 program and, if it is not already running, starts it as well. Once you get both screens showing on your monitor, you make your own effort to "tidy up" the displays because one is bound to overlap the other.

A little click and drag, and you are all set. The next time I started the program, both were in their new positions on the

Heath company must have bought 1N914 diodes by the traincarload. They're used in most Heathkits I've seen.

They're easy to check. In the HW-8, when you press one of the front panel push-buttons to select a band, 12 volts is routed to the proper switching diode. All you have to do is locate the diode, and check to see if plus-12 volts is applied to one end when the proper button is pushed in. If the diode is good, you'll see it pass the voltage. If you see the switching voltage going in, but nothing coming out, the diode is open. Likewise, if there is voltage on both ends, the diode is shorted. Also, the band selector switches have a zillion wires coming and going. A broken one may prevent the required switching voltage from reaching the proper diode.

I've discussed how the switching diodes work in each circuit in past columns. There's no need to dig into their operation again. You only need to do some simple voltage checks to find a kaput switching diode. Also, remember there are several diodes scattered around the HW-8 that must switch various parts in and out of the tuned circuits. Check all the diodes used by a given band.

Well, after checking all the diodes and for broken wires on the bandswitch, it looks like for all the world like I have a bad crystal in the mixer oscillator. The oscillator works on all the other bands, so all of its pieces parts are functional. It's only on the 20-meter band that things are dead. A scope and frequency counter show nary a peep out of the oscillator when 20 meters is selected. The only variable left is the crystal.

Crystals usually just don't up and quit. I resoldered the connections on the PC board, but, alas, 20 meters is still kaput. Guess I am going to have to order a crystal from Jan Crystals and see about getting this guy all fixed up.

HW-8s are getting old

I can remember putting my HW-8 together way back in 1978. Like the HW-8, I am a lot older and things are starting to break down. Since it's pushing over twenty years old, some care must be used when working on the rig. The PC board is the old paper-based stuff. Excess heat can easily damage the board and the copper pads. Use only enough heat to melt the solder. Solder wick works quite nicely on the board. A good vacuum desoldering tool is a nice item to have, too.

There are not too many half-watt resistors left in my junk box. You can use the now-standard quarter watt guys in most of the circuits used in the HW-8. Radio Shack stills carried some half-watt resistors the last time I looked.

The capacitors are reaching the end of their lifespan. Keep a sharp eye out for leaky electrolytic capacitors. The capacitors used in the tuned circuit may have changed values enough to cause these circuits to operate incorrectly.

Be awfully careful with the mechanical pieces parts. There's no source for such parts as the VFO variable capacitor, the meter, and the bandswitch. If these are kaput, then you'll have to go dig up another HW-8 to steal parts off of.

They're getting old, and harder and harder to find in good shape on the used market. The other night I was trolling the Internet. On eBay, an unassembled Heathkit HW-9 was going for over $600! I shudder to think about what an unassembled HW-8 would go for.

The Heathkit HW-8 is a classic QRP transceiver. You're just not a QRP operator unless you've put an HW-8 on the air. If you find one at a hamfest or via the Internet, pick it up. Even if it does not work, it's still a classic!

monitor just as I had left them. Somewhere in the Options box, I think I saw a choice to click on to cause that to happen. It was either clicked by default or I clicked it (or maybe it just works). Small item.

One really nice feature of the PSKGNR is that it allows type ahead. Very handy for those of us who don't like to look like we are stumbling through the first line or so when it is our turn to transmit. And, if you have a head start on the typing you can stay ahead for a minute or so ... right up to the time you remember where the brag file is you want to send.

Plus, it already has some macros set up, so you can enter the call of the station worked and his name and the macros will pick these up when you press the appropriate function key. For instance, the F1 key is programmed for W1XYZ de KB7NO as soon as I press R12 and enter the W1XYZ in the pop-up box.

There is more. There is a serial number feature with automatic advance. This thing is going to trap me into doing the unthinkable and get serious about contesting. It just plain makes it easy.

As you can imagine, you will need to keep track of commands for both screens. That has been simplified. What you want to remember is to keep the PSKGNR screen active and avoid the temptation to click on the upper PSK31 screen, which will activate it. That action is not a disaster. If you wish, you may use the PSK31 program as though the other program isn't running. It will work.

What the author did is about as intuitive as it gets, but I am still sneaking peeks at a cheat-sheet by the keyboard. The function keys you used to use for PSK31 still exist, if you remember those functions have a "Control" key added to them. That is, if you want to toggle the squelch in the PSK31, you use Control F2 and don't succumb to clicking the button. If you click, you have to exercise the gray matter and get back to the lower screen. It took me awhile, but I think I had an on-the-air 20 minute chat a little while ago with next to no confusion.

The plain vanilla function keys (just press them by themselves) control the new functions on the lower screen. I guess some folks would apply the logic that if we want to control the upper screen, we must use the Control key. Sounds good, works for most. You will need to keep the cheat sheet handy until you have used the new functions for a spell.

There are such functions as the ID exchange ([worked stn call] de [your call]), your call by itself, the time and date stamp, and the other operator's name. Plus, there are more than a half dozen handy mini-macros like that to keep you up on whom you are talking to and reduce the "repetitive action" syndrome. I didn't see any guarantees, but it should diminish the possibility of the active ham contracting carpal tunnel syndrome.

I nearly didn't mention another set of programmable keys. You can use the Shift key with the function keys and build your own set of handy timesavers. Also, you can set up to retrieve any larger file and send it. You will figure what works best for you. It would seem you could run the first two or three exchanges with a contact before you would need to resort to actual typing. I don't think I could stand to be that lazy, but the program offers the capability.

The screen shot is my layout for the two programs on the same monitor. You may wish to make the upper PSK31 screen a little larger in proportion, since both the transmitted and received text is on the same screen while only outgoing text is on the lower screen.

I had a little problem getting that screen shot to cooperate, so there was a bit of touch-up performed. I had to do it in black and white and it lost quite a bit of definition. I just wanted you

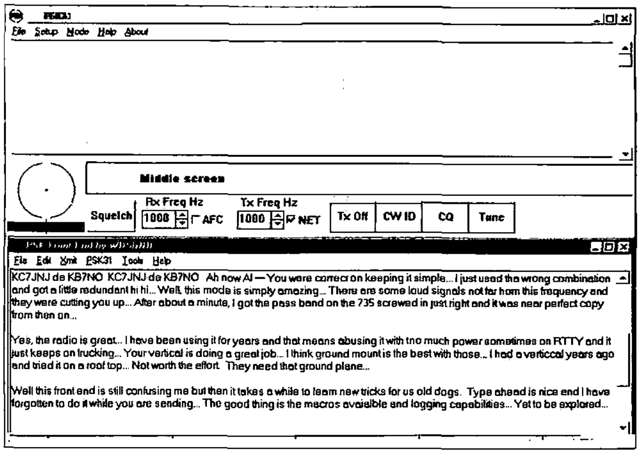

Photo A. *Screen shot. This is a view of both programs (PSK31 and PSKGNR) up and running, each occupying about half the screen. The bottom screen is used for composing your message. What you type goes here as well as any automatically inserted text. When you tell it to send, the text goes to the box just above it, labeled middle screen. In the end, the upper screen not only gets the received text but also the transmitted text. The middle screen is the composing screen in the PSK31 program if you are using it by itself. You can type ahead in the large bottom screen and the text remains there until you tell it to send. The control keys are intuitive, as they mimic the original PSK31 keys, but you have a new set of rules to learn so you can control the functions of both screens with only the lower screen activated. Very slick once you get the hang of it. In the white area at the bottom there are more useful buttons. These didn't display in the screen shot.*

to get an idea of what it looked like. The monitor does take on the full flavor and colors of any Windows program.

I have both of those programs running in the IBM laptop and they seem quite stable. That remark is because some pieces of soundcard-based communications software act very strangely in the laptop. It is a good idea, depending on the sound system of your laptop, to approach with a modest layer of apprehension. I know they do not all work as well as this one. I have not run across an authority on what is compatible and what is not. You just get to wing it.

And, I realized today, the laptop has only 256 colors. That was part of the problem with the screen shot. My wife will never understand why I need so many new toys.

PSK31 can lead to new horizons

A while back, I received a call on PSK from an enthusiastic ham who had been on the air for 25 years, was reading my mail, and gave a shout because I was the first Nevada station he ever worked. So PSK was good for him, but wait ... Joe KX4JR brought me some new wisdom that simply blew my mind.

There are two parts. The first was he pointed me to a Web site [http://members.xoom.com/ZL1BPU/Contents.html]. I plugged the address into my Netscape v.4.0 and it acted unusual. Instead of displaying a Web page, a download was initiated. I fiddled with that for a while to be sure I wasn't doing something wrong and also that the download was what was intended.

Then I put the project aside, or at least to the back of my mind, and several weeks later tried the URL again with the same setup — and got the same result. This time I had an alternate plan. I had the laptop set up on the desk and plugged it into the phone line and used the older v.3.0 Netscape. The Web site acted perfectly normal. That was worth tucking away in memory.

However, and this is BIG, that wasn't the only learning experience Joe was responsible for. The Web site, and you must go there to prove I am not pulling your leg, has description with pictures, history, and instructions of how to get started in a totally different digital communication process called Hellschreiber.

The system was invented back in the '20s, was used over phone lines, and works somewhat like a facsimile. I don't recall if the historic description included use over radio in olden times. The review is a bit long, interesting enough, so I didn't take the time to read it word for word.

It probably was never really practical for hams to experiment with until this day of the computer. That is, it was likely very heavy on the hardware side as in the earlier days of RTTY. The site directs you to downloads (free) of software that will get you into business. They even have listings of net schedules with times and frequencies. The whole idea looks like it would be a lot of fun to see it work, considering the history of the project.

So, after absorbing as much of this as I could at one sitting, I sent off to Joe the QSL I had been holding hostage and told him what a great service he did for amateur radio by letting me in on this. Now that I am passing it on to you, you too will

Current Web Addresses

Source for:	Web address (URL)
HF serial modem plans + software	http://www.accessone.com/~tmayhan/
SV2AGW free Win95 programs	http://www.forthnet.gr/sv2agw/
BayCom — German site	http://www.baycom.de/
Pasokon SSTV programs & hardware	http://www.ultranet.com/~sstv/lite.html
PSK31 — Free — orig. PSK31 — also Logger	http://aintel.bi.ehu.es/psk31.html
PSKGNR — New — Front end for PSK31	www.al-williams.com/wd5gnr/pskgnr.htm
Baycom 1.5 and Manual.zip in English	http://www.cs.wvu.edu/~acm/gopher/Software/baycom/
Source for BayPac BP-2M	http://www.tigertronics.com/
TNC to radio wiring help	http://freeweb.pdq.net/medcalf/ztx/
ChromaPIX & ChromaSound DSP software	http://www.siliconpixels.com/
Timewave DSP & AEA products	http://www.timewave.com
International Visual Communication Association — a non-profit organization dedicated to SSTV	http://www.mindspring.com/~sstv/
XPWare — TNC software with sample download	http://www.goodnet.com/~gjohnson/
Auto tuner and other kits	http://www.ldgelectronics.com
TAPR — lots of info	www.tapr.org
Creative Services Software	www.cssincorp.com

Table 1. The Infamous Chart — "Almost everything ..."

Calendar

Listings are free of charge as space permits. Please send us your Calendar item two months in advance of the issue you want it to appear in. For example, if you want it to appear in the February issue, we should receive it by December 31. Provide a clear, concise summary of the essential details about your Calendar item.

NOV 13

MONTGOMERY, AL The Montgomery ARC will host the 1999 Alabama ARRL Convention at the 22nd annual Montgomery Hamfest and Computer Show in Garrett Coliseum at the South Alabama State Fair Grounds, located on Federal Drive in the North Eastern section of Montgomery. Admission $5, free parking, all indoors, including the flea market. Flea market setup 3 p.m.–8 p.m. Nov. 12th, and 6 a.m.–8 a.m. Nov. 13th. Doors open to the public 9 a.m.–3 p.m. CST. VE exams on-site beginning at 8 a.m. Bring original and a copy of your current license, picture ID and $4. Talk-in on 146.24/.84, W4AP. Ragchew 146.32/.92 (with phone patch, *up/#down), 147.78/.18, 449.50/444.50. Flea market reservations required to ensure table. Tailgaters welcome, $5 per vehicle space. For more info write to *Hamfest Committee, c/o 2141 Edinburgh Dr., Montgomery AL 36116-1313;* or phone *Phil at (334) 272-7980 after 5 p.m. CST. E-mail [wb4ozn@worldnet.att.net].* Visit the Web site for late-breaking news and events, *[http://jschool.troyst.edu/~w4ap/].*

NOV 13–14

FT. WAYNE, IN The 27th Fort Wayne Hamfest & Computer Expo will be held Nov. 13th and 14th at the Allen County War Memorial Coliseum Exposition Center. Sponsored by the Allen County Amateur Radio Technical Society. Hours: Saturday 9 a.m.–4 p.m. EST; Sunday 9 a.m.–3 p.m. EST. No advanced ticket sales. Admission $5 at the door only. 11 years old and under free with an adult. Coliseum parking, $2 per vehicle. Talk-in on 146.88(-). New and used ham dealers. Computers and software. Forums and meetings. Flea market tables, 8-ft., $20 each. Premium tables, 8-ft., $40 each. $27.50 for electricity (110V 20A). For info or table orders, send an SASE to *ACARTS/Fort Wayne Hamfest, P.O. Box 10342, Fort Wayne IN 46851.* For more table info, call *(219) 483-8163.* For general info, call *(219) 484-1314.* Visit the Web site at *[http://www.acarts.com].*

NOV 19–20

OCEAN SPRINGS, MS The West Jackson County ARC will hold its annual Hamfest/Swapfest at the St. Martin Community Center north of Ocean Springs. The hamfest will be open to the general public from 5 p.m.–9 p.m. on the 19th, and 8 a.m.–2 p.m. on the 20th. Admission will be $2 per adult or $4 for an entire family. Take Exit 50 South from I-10 at Ocean Springs. Follow Hwy. 609 to the second light. Turn right on Lemoyne Blvd., and the Community Center is 1 mile on the right side. Free parking. RVs may park overnight if they are completely self contained. There are several motels in the vicinity of Exit 50. 8-ft. tables are $5. Advanced deposits are required for sales table reservations. Talk-in on 145.11(-) MHz, N5OS. VE exams will be held at 11 a.m. Saturday. Bring photo ID, the original license, and a photocopy of that license. The testing fee is $6.45. Contact *Phil Hunsberger W9NZ, 1207 Lancelot Lane, Ocean Springs, MS 39564, tel. (228) 872-1499; or call Stan Hecker N5SP at (228) 875-0222.*

NOV 20

GOLDEN, CO The 1999 RMRL Hamfest will be hosted by the Rocky Mountain Radio League, Inc., November 20th, 8 a.m.–2 p.m., at Jefferson County Fairgrounds, 15200 W. 6th Ave., Golden CO (Indiana Exit from 6th Ave.). Talk-in on 144.62/145.22 MHz. Admittance $4 per person; tables $10 in advance or at the door. VE exams, ARRL forum. Contact *Ron Rose NØMQJ, (303) 985-8692; E-mail [nØmqj@arrl.net].*

NEWTONVILLE, MA The Waltham ARA/1200 RC Auction and Ham Social will be held Saturday, Nov. 20th on the 2nd floor of the Newton Masonic Hall, 460 Newtonville Ave., Newtonville MA (the corner of Walnut St. and Newtonville Ave., across from the Star Market). Metered parking on the streets. Masonic Hall lot reserved for other occupants of the building. Stay away from the Star Market lot, or they'll tow your vehicle. There is free parking in the municipal lot a block away. Admission $2. Talk-in on 146.64(-) Waltham rptr. Seller check-in starts at 9:30 a.m. For directions and further info, visit the WWW site at *[http://ourworld.compuserve.com/homepages/emayer/auction.htm],* or contact *Eliot Mayer W1MJ, (617) 484-1089; E-mail [w1mj@amsat.org].*

NOV 27

EVANSVILLE, IN The 7th Annual E.A.R.S. and Ham Station Evansville Winter Hamfest will be held Sat., Nov. 27th, 8 a.m.–2 p.m.

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be indebted to Joe. He doesn't have a clue, I am sure, what honors you faithful readers will shower on him once you are aware of the golden "find." I didn't add the URL to the chart. If you think that is a serious deletion, let me know. About ten E-mails will set me straight.

If you have questions or comments about this column, E-mail me [jheller@sierra.net]. I will gladly share what I know or find a resource for you. For now, 73, Jack KB7NO.

CST at the Vanderburgh Co. 4-H Center Fairgrounds Auditorium. Free parking. Free tailgating. Commercial dealers. Indoor flea market. Setup begins at 6 a.m. Central Time. Talk-in on EARS Wide Area Rptr. Network, 145.150(-) Evansville/146.925(-) and 443.925(+) Vincennes. Alternate: EARS Rptr. 145.110(-). Please use 107.2 CTCSS on all frequencies listed. 8 ft. tables $8 each. Wall spaces $10. Admission $5. New and used equipment will be featured. Visit with representatives of Icom at the Icom Forum at 11 a.m. For more info or table reservations, contact *Neil WB9VPG at (812) 479-5741*; or write to *EARS, 1506 S. Parker Dr., Evansville IN 47714. E-mail to [EARSHAM@aol.com].* The hamfest Web site is at *[http://members.aol.com/earsham/].*

SPECIAL EVENTS, ETC.

NOV 11

ALBUQUERQUE, NM Station N5VA will operate from the Veterans Medical Center on Veteran's Day, Nov. 11th. Operation will be 16:00 UTC–04:00 UTC on 14.287, 21.325, 18.130 and 7.245 MHz, or as close to those frequencies as possible. For a 9" x 11" certificate, please send a large SASE to *VA Medical Center, 1501 San Pedro Dr. SE 117D, Albuquerque NM 87108 USA.*

NOV 13–14

CEDAR RAPIDS, IA The Cedar Valley ARC will operate Special Event Station WØGQ 1300Z–2300Z, to commemorate 50 years of CVARC. Operation will be from the club station at Kirkwood Community College (Jones Hall). Frequencies will be located ± QRM around 7.035, 7.135, 7.235, 14.035, 14.235, 21.035, 21.135, 21.235, 28.135 and 28.335, at the operator's discretion. Certificates will be issued for contacts made with WØGQ. Send a self-addressed-stamped 9x12 envelope for an unfolded certificate; or QSL for a special 50th Anniversary QSL card. For more info contact *Jim Covington at [aa0xj@ia.net].*

NOV 20–22

VALE ISLAND, NORTHWEST TERRITORIES In celebration of the 5th Anniversary of the US Islands (USI) awards program, VE8JR will be active exclusively around 28.495 from Vale Island. Operation will take place during the ARRL November Sweepstakes Contest, Nov. 20th–22nd. 17m activity will also take place from Northwest Territories and Alaska after the contest. *QSL Mgr. KL7JR (CBA).* Web site at *[http://www.eng.mu.edu/~usi].*

DEC 7

MESA, AZ The East Valley Amateur Radio Group, WA7USA, will commemorate the Battleship *USS Arizona* 1500Z–2400Z on the frequencies 14.240, 21.340, and 28.340 MHz. Stations contacted may request a certificate by sending a QSL card and a 9 x 12 SASE to *EVARG, 3264 E. Carol Ave., Mesa AZ 85204-3245 USA.*

DEC 10–11

BETHLEHEM, IN The Clark County ARC will operate W9WWI, 1500Z Dec. 10th–2200Z Dec. 11th in celebration of the Christmas season. Operation will be on General 75, 40, and 20 meters. QSL with an SASE for a certificate to *CCARC, 1805 E. 8th St., Jeffersonville IN 47130 USA.*

DEC 31–JAN 2

AUSTIN, TX The 3M ARC (W3MRC) of Austin TX will operate using the special callsign W2T, 1100 UTC Dec. 31st–2400 UTC Jan. 2nd. SSB operation will be on 7.230, 14.340, 21.410 and 28.350 MHz. For a certificate, send a large SASE with 2 stamps (see Web site for details). Send QSL to *3M ARC—W3MRC, A147-5S-03, 6801 Riverplace Blvd., Austin TX 78726-9000.* See *[www.qsl.net/w3mrc]* for more info.

NEVER SAY DIE

continued from page 6

had my first Arab horse. I'd done that.

How do you decide what business field to enter? Well, I said to find something that looks like it would be fun. Serendipity will step in to open opportunities for you, if you let it. It always has for me. For instance, I got to be good friends with Ken Grayson W2HDM, my surplus conversion editor. Ken had an MGB sports car and was having fun going on car rallies. So I looked over the sports cars and decided on a Porsche Speedster. After a couple of drives in my new Porsche, Ken sold his MGB and bought a Porsche, too.

I got all involved with rallying. Wow, was that fun! The idea is to follow a set of not too clear instructions and drive at exactly the given speed over a given route. Every so often there is a checkpoint (often hidden), timing you as you go by. You lose one point for every hundredth of a minute you're early or late. This means that you have to be armed with an exact odometer, a dependable stop watch, and a calculator.

Hundredths-of-a-mile odometers were available, but most of the stopwatches were not dependable enough for more than an hour or so. We needed better watches that would be accurate to a half second a day. That meant more jewels in the movement and compensation for temperature changes.

Most rallies were only four or five hours long, but some were overnight or even 1000-mile events, so a good watch was important. I found that one of the best was made by Hanhardt in Schwenningen, Germany. So I visited the factory and arranged to have them make some special 17-jewel rally watches that I imported and sold via small ads in the car magazines.

A cute little hand-held calculator was being made by Curta in Liechtenstein that was ideally suited for rally use. I'd been using a big

Monroe desk calculator, mounted on a stand between the navigator's legs and powered by an AC inverter in the back seat, so something the size of a small pepper grinder was a great improvement. Yes, I went to Liechtenstein and talked with the prince, who owned the factory. The calculators were mainly used for currency conversions by European banks and change offices. The factory was mostly automated, but with women doing the assembly and testing the units. I set up an agreement to import the Curtas and added them to my rally catalog. I sold hundreds of them, making a nice profit on the deal.

The one other thing that rallyists needed was a better set of time-speed-distance tables. The ones on the market filled a notebook and were difficult to use. So I figured out a much better system that required just one page of tables. Soon my customers were winning all the rallies.

Since my products were aimed at a very narrow interest group, it was easy to reach them through small ads in the sports car magazines.

What I'm trying to get across is that there are opportunities everywhere if you just keep your eyes and ears open. Rally equipment wasn't a huge business, but it was a great sideline while I was mainly publishing *73* magazine. And it sure was a lot of fun.

Working for other people sucks, so start thinking of a business that would be fun and that you could start small and grow. When you're your own boss, you'll have the freedom to travel and do things — as I have.

Over 40, Over the Hill

Hmm, are you still working for someone else? If you're over 40, you could be in trouble. Companies are waking up to the fact that younger workers work harder and longer, are more adaptable, are eager to learn, and cost a lot less than older workers. The days of working for a company until retirement at 55 are blowing away. The day of getting pay increases on a regular basis are blowing away. Heck, I'm old enough to remember when the retirement age was 65!

Now, if you're over 55, you are unemployable. If you are over 40, and looking for work, you're going to find that there's not much available, and you'll probably have to take a 40% or more pay cut.

Yes, this is unfair. But I've had an awful lot of employees over the years, so I can sympathize with companies looking for young workers. I tried hiring older people, but I found them, no matter their years of experience, to be less adaptable to our work and less productive, so I found myself looking for eager young people I could train. Indeed, my greatest employment disasters were when I brought in high-priced, experienced managers.

Of course, if you're self-employed, you've got a job for as long as you like, and never mind 40, 55, or even 65, for that matter.

Recent studies have shown that there is little difference in job performance between people who have five or 20 years of experience, which brings into question the old idea of annual raises that gradually price older employees out of their jobs.

So, if you are a working stiff, how long is it going to take for the light to go on that security lies in running your own business, not working for someone else? Blue collar workers are seeing their jobs move offshore. Managers are being replaced by information systems and younger, less expensive people. And it's only going to get worse!

Megamergers mean a megaloss of jobs, and it isn't the younger people who are getting axed. Working for a large corporation is increasingly chancy when it comes to retirement benefits. Gratitude, the least felt of all human emotions, is particularly in short supply when it comes to business.

How many of you remember retirement parties?

Stupidity

Einstein said: "The difference between genius and stupidity is that genius has its limits."

Neo Colleges

What should colleges be teaching instead of feel-good fluff courses? Please let me know if you've heard of any college that's teaching about shipping products. Like the best packaging to use and how to shop for it. The pros and cons of shipping by railroad, truck, ship, airplane, UPS, USPS, and so on. If you're importing a product from, say, Taiwan, how would be the best way to have it shipped? Do you use bulk shipments on a pallet or in containers? How important is time for you? How about the survival of delicate products? Are the temperatures during shipment a concern?

Just understanding the many post office rates is a challenge.

When time is critical, which of the "overnight" services are best?

Well, you get the idea. No matter how big or small a company, someone should have an understanding of shipping and mailing alternatives. If you leave it up to a clerk you're going to pay heavily for their ignorance. And keep right on paying.

Auto Whoopee

You've never heard of an auto whoopee? Good grief! These were wooden structures built like a roller coaster ride that you could drive on with your car (25¢). There was one down near Central Airport in Camden (Philadelphia's airport) when I was a kid. In the off hours, when it was closed, we kids used to ride our bicycles on it. Bicycle whoopee.

During the summer, when I was eight, I used to get some of my friends to come down

to the airport with me on their bicycles and my dad, who was either checking out planes for certification or logging hours, would take us up for rides. And that usually included flying upside down, which was an experience in an open cockpit plane that none of 'em will ever forget. My dad designed, built, and managed the airport, so I was around planes a lot — and he often had pilot friends over for dinner.

This was around 1930, when even our local movie theater in Pennsauken had several acts of vaudeville, complete with a live orchestra, every Saturday. That's when miniature golf got started and soon was everywhere. That's when my mother taught me to swim in the pool across the street from the airport. I immediately found I preferred swimming underwater and seeing how long I could hold my breath. I'm still at it, but now I use scuba equipment so I can stay down longer and go much deeper.

Ask any old-timer about auto whoopees. Ask 'em about how there used to be vacant lots all around their neighborhood where they used to play.

Dribbler

One of our *73* readers, Bob Nickerson, has racked up several world records. Like for dribbling four basketballs simultaneously (at the same time, all at once) for as long as five minutes and juggling three balls while shooting 20 consecutive baskets in one minute, according to the *Guinness Sports Record Book*. Bob also sent a couple pictures of him juggling three hatchets while balancing an axe on top of his head. Oops!

With so few people taking the time to build skills or in some way stand out from the crowd, I really enjoy hearing about people who have.

While You Were Sleeping

Your Congress has been busy while you've been diverted with Monica and other things of far greater interest — busy passing out money (your money, by the way — money you presumably loaf hard for between smoking breaks) or giving tax breaks (which are the same thing) to subsidize things ranging from shipbuilding, coal research, the sale of US weapons overseas, peanut farming, helping to buy crop insurance for tobacco (gee, thanks a million!), building roads into national forests for the timber industry, selling minerals on public lands at bargain basement prices, providing cut rate electricity for businesses like casinos, helping shippers use inland waterways, bailing out banks with loans gone bad in foreign countries, and endless more corporate welfare. All to the tune of over a third of a billion a day! No wonder so many people have to work two jobs to make ends meet.

I love reading about the government helping to pay for Levi Strauss to open a plant in Turkey and then paying unemployment to the 6,400 workers in this country whose jobs had been eliminated.

Then there are the export subsidies, and this is a beaut. By opening a paper-shuffling office in the Virgin Islands or some other Caribbean vacation spot, corporations are able to avoid export taxes to the tune of a couple billion dollars a year. Unfortunately, the boards of directors of these corporations are forced to attend a yearly meeting at the export site.

When I was on the board of a billion dollar corporation we had directors' meetings in places like Beijing and Sydney, all expenses paid. In Beijing, we stayed at the Emperor's Guest House complex and enjoyed three royal meals a day. I sure do want to thank you for helping to pick up the tab and making my life more exciting.

Then there's the Export-Import Bank, set up in 1934 as a measure to help get us out of the Depression. Recent reports of this outfit show them spending $51 billion of your money a year to subsidize American exports, mostly for about ten companies. Boeing alone had subsidized sales of $11 billion to some 30 countries. The rationale was that this would create more American jobs, but we have fewer people working in manufacturing today than ten years ago. And more in government than in manufacturing.

Well, that's just a sampler. There are some well-researched books reviewed in my $5 *Secret Guide to Wisdom* that cite an endless array of other government fiascoes and crooked schemes, all of which are paid for by you.

John Campbell

The Star Wars furor (and major disappointment) produced a very perceptive article by Oliver Morton in *The New Yorker* (5/17/99) on the genesis of Lucas' Galactic Empire series. Well, it was all about people I knew personally. Some were good friends.

Morton explained how John W. Campbell Jr. (W2ZGU) brought science fiction into maturity in the late 1930s and 1940s. I got to know John in the 1950s and we were good friends. A lunch with John was an exciting experience, with the conversation going from Hieronymus machines to basement nuclear bomb making. John stretched my grasp of the chemistry, physics, and psychic frontiers. It was like being on an intellectual roller coaster ride, and as exciting.

The ISSSEEM (Subtle Energies) journal has recently reprinted some of John's old editorials from *Analog*, showing how prescient they were.

As I've explained endlessly, it was John's long and fascinating editorials that encouraged me to emulate him when I first started publishing in 1951. And I've never stopped.

Morton also mentioned A.E. Van Vogt, who was also a very good friend of mine. He and his wife Mayne were superb Dianetic auditors and they helped me through the difficulties of my first divorce. Well, the first is always the most traumatic.

I met and had dinner with Azimov, but we never hit it off as friends. He was too closely surrounded by a protective clique, and too busy loudly talking to be approachable.

Arthur C. Clarke, another of Campbell's stars, is a cold fusion fan, so we've been corresponding and he's been getting my journal.

I never got to meet Heinlein, but his brother is a ham and we've been friends for years. Heinlein's *Stranger In A Strange Land* is reviewed in my wisdom guide as one of the all-time great science fiction stories.

L. Ron Hubbard was also mentioned. I also knew Ron personally and, early in the Dianetic days, he audited me. As I've mentioned before, he was a terrible Dianetic auditor.

Gee, I've had an interesting life! So what have I done that millions of other people didn't? Mostly it was keeping an eye out for interesting opportunities and then acting on them instead of staying in the normal rut of life — working at a job, family, ball games, TV.

When Campbell published Hubbard's article introducing Dianetics in his magazine in 1950, I read it. It made sense to me, so I bought the book and quickly started trying this new mental repair system out. It worked so amazingly that I quit a very good radio job and went off to learn more about Dianetics.

The big difference, I guess, is that I grab opportunities and most people don't.

When I'm a guest on the Art Bell show, about one in a thousand listeners sends for my book catalog. 99.9% of the listeners thus have passed up the opportunity to get over their chronic illnesses and add many years to their lives. And then only about 20% of those getting my catalog order my books. 80% procrastinate and miss the opportunity. 99.98% of the listeners have passed up the opportunity of their lives.

When I hear an interesting guest on the Art Bell show, see an article in a magazine, or get a clipping from a fan, I order the referenced book, read it, and follow up on the subject. Yes, this keeps me busy. But I love learning new

things and seeing how they tie in with what I've learned from other sources. All this opens endless opportunities to start new businesses—and for my writing. Maybe you've noticed.

If you have any suggestions on how I can get more people off their big fat duffs, please advise.

Connections

You, I, and everyone else have allowed Congress to gradually increase our taxes, year by year, decade by decade, from the 2% of our salaries 90 years ago, when the income tax was started, to over 50% today. Well, it's fun spending money — particularly when it isn't your money. So we have been electing and then re-electing politicians who have been having a great time spending our money, and then taxing us further so they can spend even more.

In my editorials, I've written about the many unbelievably wasteful programs we've allowed Congress to enact. Like the "War on Drugs," which has cost trillions and has accomplished absolutely nothing. Like the "War on Poverty," which has only enriched the government bureaucracy, and hasn't done spit when it comes to having fewer poor.

One result of this spending spree has been the need for both parents to work just to make enough money to support both their families and the government. Two now bring home what one used to. And this has forced parents to baby farm out their kids to day care centers and nursery schools, a good start toward dumbing them down. It also has put a big strain on husband and wife relations, contributing to the escalating divorce rate.

The family model for all of recorded history and from then on back has had the mother raising the children, while the father did the hunting, which today we call work. Go to the library and read any book you can find about primitive cultures and you'll find that in every one the mother's main responsibility was raising the children.

With what we've learned recently about how children develop, we now know enough so that we could provide day care centers which would help children to grow even better than they might at home — by providing resources which, so far, are not easily available for home teaching. I suspect that some of this vacuum will be filled via the Internet before long — for example, by providing foreign language instruction for children 1–3 years old, when they have no problem in learning to think and can speak accentlessly in almost any number of languages, and without confusing them.

Congress has had a ball taxing and spending your money. They've built a huge government structure, and gradually taken away more and more of your freedoms.

A young child needs the love and attention of a mother, not to be parked in front of a TV with 20 other kids and made to watch Sesame Street or Mr. Rodgers. Or the Teletubbies. Young children are programmed to want to learn. They want to explore, to see, to taste, to feel everything. So we pen them in until this annoying phase passes. Permanently.

Raising children is the most important and difficult work there is for a mother. Unfortunately, since most baby boomer mothers have had to go out and work, today's new parents have no mothering experience to pass along to their babies. And we wonder about the tsunami of attention deficit disorders and hyperactivity, which we "solve" with Valium, Ritalin, Prozac, Luvox, Zoloft, Paxil, Effexor, or Serzone, and never mind the side effects.

I once knew a beautiful young girl who was raised on breakfasts of white toast, grape jelly, and coffee. By the time she was 22 she had to be committed to the state hospital for the insane.

Delinquents

As I was reading Dr. Weston Price's *Nutrition and Physical Degeneration*, a 60-year-old book which is still in print, and well deserves to be, my ideas about what's gone wrong so that kids are killing kids were confirmed. I bought the book because Dr. Price was a pioneer in the nutrition field, and I'd read his *Degeneration —› Regeneration* many years ago and was very impressed by his research. He showed how destructive sugar was to the endocrine system — how that even a teaspoon of refined sugar would upset the calcium-phosphorus ratio in the blood, as well as the immune system, for a whole day, contributing to arthritis and other immune-system disorders.

Dr. Price spent years visiting people living in remote areas of the world, studying their health and teeth. What he discovered was amazing. He found that groups living on their native foods were incredibly healthy, lived long and productive lives, and had perfect teeth. They had no need for doctors or dentists.

But then, when the outside world reached them and they were introduced to sugar and white flour products, their teeth started having cavities, their jaw structures changed, their health disintegrated, and they started dying at much earlier ages. But sugar and white bread are addictive, and the results of the diet change were so slow in happening that no one noticed the connection.

He visited people early in this century in the remote islands off the Scottish coast, people living in a Swiss village that was cut off from the rest of the country, South Sea islanders, Eskimos, and so on. The story was the same everywhere, and the photos in this well-illustrated book prove what he'd discovered.

He also found that crime was virtually unknown to these people before sugar and white bread were introduced. A generation later kids were doing criminal things. Primitive tribes needed no police.

I suspect, if we could eliminate sugar and white bread from our American diet, the inner city gangs would disappear and crime would be an anomaly instead of the meat of most newspapers and TV shows. But we're so addicted to pie, ice cream, and candy that I doubt anything can be done, so we'll just have to get used to kids killing kids and stop bitching about it. We'll have to build more prisons and spend more to house the criminals we're making. Well, it's good business for lawyers, judges, the courts, police, prison guards, and so on down the line. We wouldn't want to put millions of lawyers out of business, now would we? Having no other skills, we'd have to increase our welfare system's cost. Judges, at least, could go on TV for a while and make a buck.

The 524-page 6th edition by Dr. Price is $20, ISBN 0-87983-816-7, Keats Publishing, Box 876, New Canaan CT 06840. Dr. Price is not a great writer, but his data is unassailable and fascinating.

The next time you order apple pie and ice cream, remember that it is shortening your life as surely as smoking a cigarette, and that if you eat this crap before you conceive a child it is going to some degree to deform your child, physically and mentally. It's no wonder that kids are going berserk and their grades are plummeting.

Night Lights

An article in *Nature* (May 13th) reported a strong correlation between nearsightedness in children with the use of night lights when they were babies. The same phenomenon has been observed in chicks, so it was no big surprise.

Well, it makes sense that night lights could affect children. Up until Tommy Edison invented the electric light people tended to go to sleep when it got dark, so this is a pattern which has been embedded in the deepest and oldest part of the brain, what's called the reptilian

Continued on page 61

Number 60 on your Feedback card

Propagation

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November

November will exhibit variable DX conditions on the HF bands, ranging from Poor to Good, as shown on the calendar. The days 1st–5th and 18th–22nd are expected to provide GOOD DX paths to most areas of the world, but signals may not be quite as strong as during the best days of September or October, due to the reduced E- and F-layer ionization at the onset of winter in the northern hemisphere.

POOR conditions for DX are expected on the 7th and 8th and again on the 25th and 26th, with the remaining days of the month trending between the extremes.

Those with good ears and good receivers will make the best of the FAIR conditions between the 10th–12th; the 15th and 16th; and again from the 28th–30th.

Aunospheric storms and other geophysical disturbances are also likely during the 7th and 8th and again on the 25th and 26th.

Happy Thanksgiving!

December

And Season's Greetings!

DXers can look forward to reasonably Good (G) radio propagation between the 9th and 17th; Fair (F) DX on the 19th, 20th, 23rd, 24th, and 28th; and Poor (P) or Very Poor (VP) propagation, with an upset to active geomagnetic field and a disturbed ionosphere on the 3rd through the 6th, and again on the 29th. The remaining days show trending conditions (see calendar).

Although winter DX propagation on the HF bands above 20 meters is generally poorer than in the Spring or Fall, because excitation of the E and F layers in the ionosphere is less, the solar flux index is expected to be up around the 200 level at this part of the sunspot cycle and DX propagation ought to be much better than it was last December.

Please pay particular attention to weather conditions December 3rd through the 6th, and again on or about the 30th, when severe winter storms could occur in parts of the United States. Other geophysical disturbances are also possible here and elsewhere in the world during these three or four days, so be prepared.

Forecasters are undecided about the anticipated occurrence of Cycle 23's sunspot maximum. Some predict it will occur sometime in the year 2000, while others — including

November 1999

SUN	MON	TUE	WED	THU	FRI	SAT
	1 G	2 G	3 G	4 G	5 G-F	6 F-P
7 P	8 P	9 P-F	10 F	11 F	12 F	13 F-P
14 P-F	15 F	16 F	17 F-G	18 G	19 G	20 G
21 G	22 G	23 G-F	24 F-P	25 P	26 P	27 P-F
28 F	29 F	30 F				

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	15/17	20/30	-	-	-	-	20/30	20/30	-	-	-	15/17
ARGENTINA	20/30	20/30	40	40	-	-	-	-	-	10/12	10/12	15/17
AUSTRALIA	15/17	-	20/30	-	-	40	20/30	20/30	-	-	-	15/17
CANAL ZONE	15/17	20/30	40*	40*	40	-	20/30	20/30	20/30	10/12	10/12	15/17
ENGLAND	40	40	40*	40	-	-	20/30	15/17	10/12	10/12	20/30	20/30
HAWAII	15/17	20/30	20/30	40	40	40	20/30	20/30	-	-	10/12	10/12
INDIA	-	-	-	-	-	-	20/30	20/30	-	-	-	-
JAPAN	15/17	20/30	-	-	-	-	20/30	20/30	-	-	-	15/17
MEXICO	15/17	20/30	40*	40*	40	-	20/30	20/30	20/30	10/12	10/12	15/17
PHILIPPINES	-	-	-	-	-	-	20/30	20/30	-	-	-	-
PUERTO RICO	15/17	20/30	40*	40*	40	-	20/30	20/30	20/30	10/12	10/12	15/17
RUSSIA (C.I.S.)	40	40	-	-	-	-	-	15/17	15/17	20/30	-	-
SOUTH AFRICA	20/30	-	-	-	-	-	-	-	15/17	15/17	10/12	20/30
WEST COAST	40	80	-	-	-	-	-	20/30	20/30	20/30	15/17	40

CENTRAL UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	15/17	-	-	-	-	-	-	-	-	-	-	15/17
ARGENTINA	15/17	20/30	20/30	40	40	-	-	-	-	-	10/12	15/17
AUSTRALIA	15/17	20/30	20/30	20/30	-	40	80	-	-	-	-	15/17
CANAL ZONE	15/17	20/30	20/30	40*	40*	-	-	15/17	15/17	10/12	10/12	15/17
ENGLAND	-	40/80	40/80	-	-	15/20	15/17	15/17	20/30	20/30	20/30	-
HAWAII	15/17	20/30	20/30	40	40	40*	80	20/30	-	-	10/12	15/17
INDIA	-	-	-	-	-	-	-	20/30	-	-	-	-
JAPAN	15/17	-	-	-	-	-	-	-	-	-	-	15/17
MEXICO	15/17	20/30	20/30	40*	40*	-	-	15/17	15/17	10/12	10/12	15/17
PHILIPPINES	15/17	20/30	-	-	-	-	-	20/30	-	-	-	-
PUERTO RICO	15/17	20/30	20/30	40*	40*	-	-	15/17	15/17	10/12	10/12	15/17
RUSSIA (C.I.S.)	-	-	-	-	-	-	-	20/30	15/17	20/30	-	-
SOUTH AFRICA	20/30	-	-	-	-	-	-	-	-	15/17	15/17	20/30

WESTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	10/15	15/17	15/17	20/30	20/30	20/30	40	40	-	-	-	15/17
ARGENTINA	10/15	20/30	20/30	40-	-	-	-	-	-	-	15/17	10/15
AUSTRALIA	10/12	15/17	15/17	20/30	20/30	40-	40	40-	20/30	20/30	15/20	15/17
CANAL ZONE	20/30	20/30	40/20	40/20	40	-	-	20/30	15/17	15/17	10/12	10/12
ENGLAND	-	-	-	-	-	-	-	-	-	15/20	15/20	-
HAWAII	10/12	15/17	20/15	40	40*	40*	40	40	-	20/30	20/30	20/30
INDIA	15/20	15/20	-	-	-	-	-	-	20-	-	-	-
JAPAN	10/15	15/17	15/17	20/30	20/30	20/30	40-	40-	-	-	-	15/17
MEXICO	20/30	20/30	40/20	40/20	40	-	-	20/30	15/17	15/17	10/12	10/12
PHILIPPINES	15/20	15/20	-	20/30	-	40-	40-	-	20/30	20/30	-	15/17
PUERTO RICO	20/30	20/30	40/20	40/20	40	-	-	20/30	15/17	15/17	10/12	10/12
RUSSIA (C.I.S.)	-	-	-	-	-	-	-	-	20/30	-	-	-
SOUTH AFRICA	20/30	20/30	-	-	-	-	-	-	-	15/17	15/17	20/15
EAST COAST	40	80	-	-	-	-	-	20/30	20/30	20/30	15/17	40

Table 1. November Band-Time-Country chart.

December 1999						
SUN	MON	TUE	WED	THU	FRI	SAT
			1 G-F	2 F-P	3 P-VP	4 VP
5 VP-P	6 P	7 P-F	8 F-G	9 G	10 G	11 G
12 G	13 G	14 G	15 G	16 G	17 G	18 G-F
19 F	20 F	21 F-G	22 G-F	23 F	24 F	25 F-G
26 G	27 G-F	28 F	29 F-P	30 P	31 P-F	

this writer — tend to expect it sometime in 2001. Contrary to earlier expectations (and hopes) among radio amateurs, Cycle 23 is likely to rank as less than average, or poor, compared to previous recent cycles.

Nevertheless, the gradual decline of a cycle takes place over a period of five or six years until its sunspot minimum, so we still have a lot of good DX to look forward to in Cycle 23.

Remember to check the bands above and below the suggested ones for possible DX surprises. It's often a good idea to park your receiver on a seemingly unused frequency and just wait. A DX station is very likely to pop up before any one else hears him, and you can snag a good catch.

Please note that on the Band-Time-Country charts, (*) indicates a possible 80 meter opening, and (-) or (open) indicates a difficult path. Good hunting! W1XU/7.

GMT:		02	04	06	08	10	12	14	16	18	20	22
EASTERN UNITED STATES TO:												
ALASKA	15	20					20	20				15
ARGENTINA	20	40	40	40			20	15	15	10	10	15
AUSTRALIA	15	20	20		40	40	40			20	20	15
CENTRAL AM.	20	20	20	20	20	20	20	15	10	10	15	15
ENGLAND	40	40	40*	40*		20	15	10	15	20	20	
HAWAII	15	20					20	20	20	10	10	15
INDIA							20	20				
JAPAN	15	20					20	20				15
MEXICO	20	20	20	20	20	20	20	15	10	10	15	15
PHILIPPINES							20	20				
PUERTO RICO	20	20	20	20	20	20	20	15	10	10	15	15
RUSSIA (C.I.S.)							20	15	20	20		
SOUTH AFRICA	20	40*					20	10	10	10	15	20
WEST COAST	15/20	20/40	80	160	160	160				10	10	15
CENTRAL UNITED STATES TO:												
ALASKA	15							20				15
ARGENTINA	20	20	20	40	40		20	20	15	10	15	15
AUSTRALIA	15	20	20				40				15	10
CENTRAL AM	15	20	40	40*	40*		20	15	10	10	10	15
ENGLAND	40	40	80					20	15	15	20	40
HAWAII	15	20		40	40	40*	40*	20	20	15	10	15
INDIA								20				
JAPAN	15							20				15
MEXICO	15	20	40	40*	40*		20	15	10	10	10	15
PHILIPPINES	15	20						20				15
PUERTO RICO	15	20	40	40*	40*		20	15	10	10	10	15
RUSSIA (C.I.S.)								20	15	20		
SOUTH AFRICA	20	40						15	10	10	15	20
WESTERN UNITED STATES TO:												
ALASKA	10	15	20				40	40	40			20
ARGENTINA	15	20		40	40			20		10	10	15
AUSTRALIA	10	15	20	20			40*	40*	20	20	15	15
CENTRAL AM.	15	20	20					20	15	10	10	10
ENGLAND	20	40	40						15	15	20	20
HAWAII	10	15	20	40	40	40		20	20	15	15	10
INDIA		15	20						20			
JAPAN	10	15	20				40	40	40			20
MEXICO	15	20	20					20	15	10	10	10
PHILIPPINES	10	15/20	15/20			40	40	40		20		20
PUERTO RICO	15	20	20				40	40	40			20
RUSSIA (C.I.S.)									20	20		
SOUTH AFRICA	20	20							15	10	15	15
EAST COAST	15/20	20/40	80	160	160	160				10	10	15

Table 2. December Band-Time-Country chart.

Never say die
continued from page 59

brain. You mess with deeply embedded life patterns at your risk. Oh, the many ways we are unknowingly deforming our children!

If parents were aware that smoking, even before conception, would to some degree deform their children, would that be enough to get them to stop? And the same goes for eating sugar, white flour products, and growth hormone and antibiotic-loaded milk and beef. These poisons all affect the sperm and ova.

"But Mommy, I'm afraid of the dark!" "All the better for the bogey man to sneak out from under your bed and get you, my dear."

And if that isn't enough, if you'll read about melatonin, you'll find that even the light when you go to the bathroom at night will stop your body from making melatonin. When the light hits your eyes and the message goes to your system that it must be morning, so stop making melatonin.

So what? Spring $7 for Dr. Reiter's Bantam book, *Melatonin*, and read for yourself. This stuff, normally made in the pineal gland, helps you sleep sounder, combats jet-lag, counteracts stress, fights off viruses and bacteria, plays a role in how long you live, and even helps protect you from cancer and heart disease. So don't screw around with your melatonin factory by leaving a light or your TV on at night. You may also want to take some supplementary melatonin just before going to bed at night, since as you get older your melatonin factory gets lazy, contributing to your ability to die sooner than might otherwise happen.

The Tesla Society

The International Tesla Society in Colorado Springs seemed to be doing well for many years, hosting some fascinating yearly conferences. I attended three of 'em and was a speaker on cold fusion developments and atomic physics at one. Their book shop was a treasure chest of interesting books. They made far more money on me at their book store during their conferences than from the conference fees. They always had a ham station set up in the hosting hotel lobby, with plenty of hams attending their conferences. Though they attracted a lot of phonies as speakers, they also managed to find some who had valuable information, helping me to make some wonderful contacts.

So I was surprised and disappointed when the Tesla Society stopped sending magazines and disappeared, with no more conferences announced.

Then came an announcement of an Exotic Research conference in Seattle last March, listing quite an array of speakers. I was disappointed not to see me listed, but them's the breaks. I really enjoy talking to a room full of people, and the bigger the room, the better. Heck, I haven't the slightest qualms about talking to Art Bell's millions of listeners. On the other hand, traveling to Seattle for a conference would take almost a week out of my life, putting me one more week behind in my work. And all that to talk with a couple hundred or so attendees.

On the plus side I'd get to listen to some interesting talks and make some fascinating friends. And meet some turkeys.

Then an identical announcement came in for a conference in Mesa (AZ) next July 27–30th. Same cast of characters. Hmm. So I called and found that there were some postal problems which resulted in the Seattle conference being canceled. You can get the details on where and who will be speaking about what from Exotic Research, Box 411, Stanfield AZ 85272, or call 520-424-3581.

I asked what had happened to the Tesla Society and was told that they'd gone bankrupt and that Dennis Lee had bought their assets. I'd wondered what Dennis was doing these days. The last I'd heard he had been taking his magic act around the country selling

distributorships for his nonexistent products. My letters to him have gone unanswered. I did enjoy the video of him demonstrating his "inventions," but since they seemed to defy any scientific explanation, I was skeptical. I read his book which told about him being put in prison as a confidence man. Well, we'll see what comes of his Tesla Society purchase.

Enough Hours

This is about me. Well, hell, I keep asking the people who hear me on the Art Bell show to tell me something about themselves, so I'll share a little of my life with you.

My main problem is that there is so much to do and so few hours. There are so many books on my shelves that I haven't read yet, each one a treasure of information and ideas. Each one an adventure of the mind. Then there are the Dilbert books, which have me roaring with laughter.

I've got thousands of CDs that I want to listen to over and over again. The thrill of the Gottschalk Tarantella, the incredible beauty of Delius' music. Nirvana. The Offenbach cello concerto, which I've only played a thousand times so far. Talk about industrial strength stress reduction!

Oh, how I wish you could share with me the books, the music, and my walks in our north pasture, where every few days in the spring brings out a new array of wild flowers. The excitement of seeing the wild life—a dozen deer in our front yard, a couple of dozen wild turkeys going methodically across the pasture I can see over my Macintosh as I write, the wolf I spied from my bedroom window the other morning. Pheasants, raccoons, bears, elk, coyotes, buzzards, we've got 'em all.

There's the fun of writing. I have this need to teach, so I research things that interest me and then write about them—to share with you what I've learned. I try to make it entertaining, as teaching should always be. Oh, how I remember the struggle I had to stay awake in class as a teacher droned on. And the day the professor pointed to one of the students, "You! Wake up that man next to you!" He answered, "You wake him up, you put him to sleep," which got a huge laugh from the bored students and almost killed the professor with apoplexy.

Plant Growth

With the development of a rotary transducer in 1966, it became possible to measure plant growth to an accuracy of ± 0.001 inches. This made it possible to much more accurately measure the effect of thought on plant growth. The experiment was set up growing some rye seeds. The strip recorder showed that they were growing at a steady 0.00625 inches an hour. Olga Worrall, a well-known psychic who was 600 miles away, was called and asked to speed up the growth at a specific time. The strip had been steady until that time, when it suddenly went to 0.0525 inches an hour! The growth gradually slowed down over the next 48 hours, but it never went back to its original rate. Olga's thoughts accelerated the rye growth by eight times, just by concentrating her thoughts on it remotely.

If thoughts can affect plants that powerfully, I wonder what they can do for or to humans? Maybe there's more to voo-doo and witch doctors than just imagination and suggestion.

But you don't have to be a psychic to demonstrate the power of thought to influence plant growth. You can do it in your kitchen with some seeds planted in plastic cups of dirt. Your positive thoughts will accelerate the growth and your negative thoughts will slow it down.

Scientific Progress

Science *has* progressed, despite the best efforts of the scientific establishment to prevent it. At least two Nobel laureates have admitted that they lied about their proposed research work on their grant applications because they knew the peer review process would never allow them to pursue their real goals.

This peer review process has prevented most truly innovative papers from being published in the scientific journals. An article in the *JAMA* pointed out that "... some of the most distinguished of scientists may display sophisticated behavior that can only be described as pathological."

History supports the blindness of scientists when faced with something new, from Copernicus to Galileo, Darwin, Mendel, Ohm, Young, Harvey, Flemming, Wegener, Semmelweis, Pasteur, Lister, and so on.

The tomato was shunned in America for over 200 years after it was accepted in Europe because "everyone knew" it was poisonous.

The scientific establishment was horror-struck when Pons and Fleischmann, two respected electrochemists, held a press conference to announce cold fusion instead of submitting their paper to a peer-reviewed journal. Not being total dummies, P&F knew they'd just be wasting precious months going the peer review route, there being no peers in this new solid-state microfusion field, and the reaction they'd discovered was well known to be totally impossible.

When one of the pioneers in this new field, distinguished professor Ed Storms, opined that the transmutation of elements was involved in the generation of the excess heat, his colleagues at Texas A&M ganged up and tried to have him fired for suggesting such heresy. Witch burning is apparently still popular in Texas.

Magnets & Healing

I had an interesting letter from reader Rod Summit that I want to share with you. Rod was in a car accident several years ago which damaged his neck and back and left him in constant pain, making it extremely difficult to sleep without heavy narcotic medication. Then he heard about magnetic mattress pads and tried one. Within a few days he was sleeping without pain

Continued on page 64

June Contest Winners

Grand Prize Winner

John Dougus NØISL

Runners-Up

1. Tony Capelle N1TC
2. Bob Kerry NY1Y
3. William Thim N1QVQ
4. Ted Melinosky K1BV
5. William Miller Jr., MA
6. Gary Devlin N2VIP
7. Don Stoddard N8LNE
8. A. Albanowicz KU4HN
9. D.S. Burke W5DSB
10. Frank Lauri N2IX
11. John W. Bay, Jr. N3ULD
12. Shane Brady WB2WPM
13. David Freeman W4OLA
14. B, Artman KB3CLB
15. L. Edelstein W4JEM
16. J. Siomkajlo N3QJM
17. George Gaskill KD9EN
18. M. Martineau W1AYC
19. Milt Forsberg K9QZI
20. T. Hinkelman N8JKR
21. Mike Kitchen N8QES
22. Steve Adams KF4NAT
23. Karl Heil WD9BGA
24. W. Conlon K9KOD
25. Bill Fairley WA4TCC
26. J. Guzewicz W4IDC
27. Joklahr Keller WD8JPF
28. Sidney Gogel W2FUR
29. E. Sinclair KD4JUH
30. R. Mollentine WHØKKC
31. Max Holland W4MEA
32. Ed Rich W2SLW
33. Mike Leahan N9PQK
34. Tay Tambolas KZ3U
35. J. Schnieders N9IYI
36. Bill Vokac K9BV
37. J. Shaw KM5AD
38. Brian Lecuyer AA2QU
39. John Orton WA6BOB
40. G. Hopper KB7WSD
41. Greg Saville N7IDB
42. Ervin Sly W6ERV
43. David Nagel W9EXJ
44. M. Kazlauskas WA2NGT
45. Tony Padavich N9YPN
46. W. "Jim" Poulos WB6ZJA
47. H. Landsberg WB6MEU
48. Stan Podger VE3DNR
49. Chris D. Hill AB6FA
50. George White KB1NP

Wise Up!

Here are some of my books which can change your life (if you'll let 'em). If the idea of being healthy, wealthy and wise interests you, start reading. Yes, you can be all that, but only when you know the secrets which I've spent a lifetime uncovering.

......*Wayne*

The Bioelectrifier Handbook: This explains how to build or buy ($155) a little electrical gadget that can help clean the blood of any virus, microbe, parasite, fungus or yeast. The process was discovered by scientists at the Albert Einstein College of Medicine, quickly patented, and hushed up. It's curing AIDS, hepatitis C, and a bunch of other serious illnesses. The circuit can be built for under $20 from the instructions in the book. $10 (01)

The Secret Guide to Wisdom: This is a review of around a hundred books that will help you change your life. No, I don't sell these books. They're on a wide range of subjects and will help to make you a very interesting person. Wait'll you see some of the gems you've missed reading. $5 (02)

The Secret Guide to Wealth: Just as with health, you'll find that you have been brainwashed by "the system" into a pattern of life that will keep you from ever making much money and having the freedom to travel and do what you want. I explain how anyone can get a dream job with no college, no résumé, and even without any experience. I explain how you can get someone to happily pay you to learn what you need to know to start your own business. $5 (03)

The Secret Guide to Health: Yes, there really is a secret to regaining your health and adding 30 to 60 years of healthy living to your life. The answer is simple, but it means making some difficult lifestyle changes. Will you be skiing the slopes of Aspen with me when you're 90 or doddering around a nursing home? Or pushing up daisies? No, I'm not selling any health products. $5 (04)

My WWII Submarine Adventures: Yes, I spent from 1943-1945 on a submarine, right in the middle of the war with Japan. We almost got sunk several times, and twice I was in the right place at the right time to save the boat. What's it really like to be depth charged? And what's the daily life aboard a submarine like? How about the Amelia Earhart inside story?If you're near Mobile, please visit the Drum. $5 (10)

Travel Diaries: You can travel amazingly inexpensively – once you know the ropes. Enjoy Sherry and my budget visits to Europe, Russia, and a bunch of other interesting places. How about a first class flight to Munich, a rented Audi, driving to visit Vienna, Krakow in Poland (and the famous salt mines), Prague, back to Munich, and the first class flight home for two, all for under $1,000. Yes, when you know how you can travel inexpensively, and still stay in first class hotels. $5 (11)

Wayne's Caribbean Adventures: More budget travel stories – where I visit the hams and scuba dive most of the islands of the Caribbean. Like the special Liat fare which allowed us to visit 11 countries in 21 days, with me diving all but one of the islands, Guadeloupe, where the hams kept me too busy with parties. $5 (12)

Cold Fusion Overview: This is both a brief history of cold fusion, which I predict will be one of the largest industries in the world in the 21st century, plus a simple explanation of how and why it works. This new field is going to generate a whole new bunch of billionaires, just as the personal computer industry did. $5 (20)

Cold Fusion Journal: They laughed when I predicted the PC industry growth in 1975. PCs are now the third largest industry in the world. The cold fusion ground floor is still wide open, but then that might mean giving up watching ball games. Sample: $10 (22).

Julian Schwinger: A Nobel laureate's talk about cold fusion—confirming its validity. $2 (24)

Improving State Government: Here are 24 ways that state governments can cut expenses enormously, while providing far better service. I explain how any government bureau or department can be gotten to cut its expenses by at least 50% in three years and do it cooperatively and enthusiastically. I explain how, by applying a new technology, the state can make it possible to provide all needed services without having to levy *any* taxes at all! Read the book, run for your legislature, and let's get busy making this country work like its founders wanted it to. Don't leave this for "someone else" to do. $5 (30)

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Yes! Put me down for a year of *73* for only $25 (a steal). Canada US$32. Foreign US$44 by sea.

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Allow 4 weeks for delivery except foreign, though we try to get most orders shipped in a day or two.

Number 64 on your Feedback card

Barter 'n' Buy

Turn your old ham and computer gear into cash now. Sure, you can wait for a hamfest to try and dump it, but you know you'll get a far more realistic price if you have it out where 100,000 active ham potential buyers can see it, rather than the few hundred local hams who come by a flea market table. Check your attic, garage, cellar and closet shelves and get cash for your ham and computer gear before it's too old to sell. You know you're not going to use it again, so why leave it for your widow to throw out? That stuff isn't getting any younger!

The *73* Flea Market, Barter 'n' Buy, costs you peanuts (almost)—comes to 35 cents a word for individual (noncommercial!) ads and $1.00 a word for commercial ads. Don't plan on telling a long story. Use abbreviations, cram it in. But be honest. There are plenty of hams who love to fix things, so if it doesn't work, say so.

Make your list, count the words, including your call, address and phone number. Include a check or your credit card number and expiration. If you're placing a commercial ad, include an additional phone number, separate from your ad.

This is a monthly magazine, not a daily newspaper, so figure a couple months before the action starts; then be prepared. If you get too many calls, you priced it low. If you don't get many calls, too high.

So get busy. Blow the dust off, check everything out, make sure it still works right and maybe you can help make a ham newcomer or retired old timer happy with that rig you're not using now. Or you might get busy on your computer and put together a list of small gear/parts to send to those interested?

Send your ads and payment to: *73 Magazine*, Barter 'n' Buy, 70 Hancock Rd., Peterborough NH 03458 and get set for the phone calls. The deadline for the March 2000 classified ad section is January 10, 2000.

NEVER SAY DIE

continued from page 62

and was able to put his pain pills aside.

I've seen ads for the pads, but being a skinflint, and not sure what the benefits might be for me, I haven't invested in one. I don't have any pains and I have no problem in going to sleep when I lie down, day or night. And I worry about magnets, since one pole can increase blood flow and the other restrict it. Do I want to take a chance on messing up something that's working okay now? 73

If you're a No-Code Tech, and you're having fun operating, tell us about it! Other No-Code Techs will enjoy reading about your adventures in ham radio—and we'll pay you for your articles. Yes, lots of nice clear photos, please. Call Joyce Sawtelle at 800-274-7373 to get a copy of "How to Write for *73* Magazine."

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More Tuner Mods

Secret — page 14

12

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DECEMBER 1999
ISSUE #470

73 Amateur Radio Today

TABLE OF CONTENTS

FEATURES

DEPARTMENTS

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On the cover: HAARP secrets revealed beginning on page **14**. We are always looking for interesting articles and cover photos — with or without each other. Your name could be in this space *next* month, and our check could be on its way to *you!* Couldn't you use a little extra cash?

Feedback: Any circuit works better with feedback, so please take the time to report on how much you like, hate, or don't care one way or the other about the articles and columns in this issue. G = great!, O = okay, and U = ugh. The G's and O's will be continued. Enough U's and it's Silent Keysville. Hey, this is *your* communications medium, so don't just sit there scratching your...er...head. FYI: Feedback "number" is usually the page number on which the article or column starts.

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NEVER SAY DIE

Wayne Green W2NSD/1
w2nsd@aol.com

The Latin Exam

Well, by golly, amateur radio hit the front page of *The Wall Street Journal!* That's the good news. The bad news is that the article made us look like idiots and is unlikely to do anything but turn away even more prospects. The article compared the value of our code exam, for which the League seems willing to kill the hobby in order to preserve, to a Latin exam. It's about as relevant.

Sure, I agree, there are still dozens of old-timers who enjoy the arcane art of CW. We have lots of antique car buffs, too, but that's no reason to make the test for a driver's license include being able to crank a car to start it.

When I first got on the air 60 years ago, around 95% of all ham contacts were via CW. Today it's more like 5%, and definitely time to get out of the 19th century and recognize that the calendar is turning over to the 21st.

If your ARRL director dares to show his face at a club meeting, please do your best to give him a brain enema about this damned code crap and stop the ARRL from making us all look like jerks.

Again, I have nothing against CW, which is just one of the many modes available to us. I just don't like seeing amateur radio being blown away because the ARRL directors want to force us to do what they are convinced is good for us.

In case you haven't noticed, our hobby is dying, and not slowly, either. The monthly FCC figures on new licenses and upgrades are dropping fast.

Ham dealers are going out of business, as are more and more manufacturers. The attendance at Dayton was way down, with empty exhibitor booths everywhere. Ads in *73* are way down, and they're also down in QST, as the industry slowly shrivels away.

The *Journal* reporter was way off base on one point. He said that learning to copy 20 wpm can take years to learn. Well, that's probably right if you use the ARRL system. If you use mine, which takes sneaky advantage of how the brain is wired, you can start from scratch and copy 20 wpm in a few days. Some people do it in a weekend.

This is supposed to be a technical hobby, not a skill hobby, so let's kill the code test requirement before it kills us.

Progress

I'll bet some readers are old enough to remember when the US amateurs were the innovators. The UK, which used to be known as Great Britain, has announced that they're going to lower the code speed requirement for operation on all the HF bands to 5 wpm. Further, they say they expect the next ITU meeting in 2002 or 2003 to do away with the Morse Code requirement entirely, which they will then also do.

Meanwhile the ARRL directors you've elected, and then continued to re-elect, want to continue to maintain the Morse Code barrier for HF operating — thus keeping over half of our licensees from being able to use the HF bands (and perhaps thus guaranteeing that they'll quickly lose interest in the hobby and go away). Talking about very little or less over the local repeater doesn't hold much interest for any but those with low-double-digit IQs.

With an estimated 80% of licensees inactive, there's little incentive to bother renewing their license when it comes up for renewal in ten years. If we make it through Y2K and the other potential disasters predicted for the next few years, unless the ARRL directors wake up we could well be down to 250,000 licensees within ten years. And dropping fast.

Hello, Newington! You're up against the Internet now! And, after many years of almost total obscurity and lack of promotion, few kids today have even heard of amateur radio. Is anybody awake there?

An Education

I see where Bill Gates is now worth $100 billion. Not bad for a kid who read my editorials in *Byte* and *Microcomputing* magazines and dropped out of college to start a little software entrepreneurial business back in 1976. We've been so thoroughly taught to equate an "education" with a college degree that almost everyone believes it. Well, it's a crock.

Richard Sears didn't go to college, and neither did Aaron Montgomery Ward. Nor James Cash Penney Jr., and their stores have done fairly well. John Jacob Astor, who became the richest man in America, left home and started working as a teenager. So did Wall Street financier Jay Gould and steel magnate Andrew Carnegie, oil tycoon John D. Rockefeller, Henry Ford, and David Sarnoff. A recent *Inc.* magazine survey showed that virtually every successful entrepreneur either skipped college or dropped out.

I suspect it was their early start in business that gave them all the edge.

The lesson to be learned from this is that college is for suckers. My own wasted four years in the institution taught me one thing: that almost none of the courses I sweated through have been of the slightest benefit to me in the many businesses I've been in — radio, television, publishing, manufacturing, and retailing in the communications, electronics, computer, and music fields.

Indeed, a college degree is almost invariably a guarantee that a youngster is never going to make a lot of money. Yet, despite all experiences to the contrary, you'll be hard put to find anyone who hasn't been convinced of the enormous value of a college degree. And I'll be surprised if anything I can write will change your deeply embedded belief in college. "There goes Wayne again."

Education *is* important, but it's self-education that counts, not the number of exams you've crammed for in order to get a degree (and then forgotten). When I finally wised up and started my first business, one of the first things I did was take a course in advertising put on by the Advertising Club of New York. I'm quite sure that no college teaches the invaluable things I learned there. And that got me to reading books on advertising because I wanted to learn all I could.

Our child labor and minimum wage laws, which the labor unions have bribed Congress to pass to prevent competition from kids, have done incalculable harm to youngsters.

Yes, of course colleges could be made relevant to the 21st century, but that's going to be over the dead bodies of the college faculties. In my editorials, which I reprinted in my *Declare War* book, and cited again in my *Improving State Government* book ($5, book #30), I explained a simple way college educations could be made relevant.

Continued on page 18

QRX . . .

The X(mas)-Files

57 GREEN ST.
BETHLEHEM PA
11:51 PM DEC 24

We're too late! It's already been here, Mulder. I hope you know what you're doing.

Look, Scully, just like the other homes: Douglas fir, truncated, mounted, transformed into a shrine; halls decked with boughs of holly; stockings hung by the chimney, with care.

You really think someone's been here?

Someone, or something.

Mulder, over here — it's a fruitcake.

Don't touch it! Those things can be lethal.

It's OK. There's a note attached: "Gonna find out who's naughty and nice."

It's judging them, Scully. It's making a list.

Who? What are you talking about?

Ancient mythology tells of an obese humanoid entity who could travel at great speed in a craft powered by antlered servants. Once each year, near the winter solstice, this creature is said to descend from the heavens to reward its followers and punish disbelievers with jagged chunks of anthracite.

But that's legend, Mulder — a story told by parents to frighten children. Surely you don't believe it?

Something was here tonight, Scully. Check out the bite marks on this gingerbread man. Whatever tore through this plate of cookies was massive — and in a hurry.

It left crumbs everywhere. And look, Mulder, this milk glass has been completely drained.

It gorged itself, Scully. It fed without remorse.

But why would they leave it milk and cookies?

Appeasement. Tonight is the Eve, and nothing can stop its wilding.

But if this thing does exist, how did it get in? The doors and windows were locked. There's no sign of forced entry.

Unless I miss my guess, it came through the fireplace.

Wait a minute, Mulder. If you're saying some huge creature landed on the roof and came down this chimney, you're crazy. The flue is barely six inches wide. Nothing could get down there.

But what if it could alter its shape, move in all directions at once?

You mean, like a bowl full of jelly?

Exactly, Scully. I've never told anyone this, but when I was a child my home was visited. I saw the creature. It had long white shanks of fur surrounding its ruddy, misshapen head. Its bloated torso was red and white. I'll never forget the horror. I turned away, and when I looked back, it had somehow taken on the facial features of my father.

Impossible.

I know what I saw. And that night it read my mind. It brought me a Mr. Potato Head, Scully. It knew that I wanted a Mr. Potato Head!

I'm sorry, Mulder, but you're asking me to disregard the laws of physics. You want me to believe in some supernatural being who soars across the skies and brings gifts to good little girls and boys. Listen to what you're saying. Do you understand the repercussions? If this gets out, they'll close the X-Files.

Scully, listen to me: It knows when you're sleeping. It knows when you're awake.

But we have no proof.

Last year, on this exact date, SETI radio telescopes detected bogeys in the airspace over 27 states. The White House ordered a Condition Red. But that was a meteor shower. Officially. Two days ago, eight prized Scandinavian reindeer vanished from the National Zoo in Washington DC. Nobody — not even the zookeeper — was told about it. The government doesn't want people to know about Project Kringle. They fear that if this thing is proved to exist, the public will stop spending half its annual income in a Christmas shopping frenzy. Retail markets will collapse. Scully, they cannot let the world believe this creature lives. There's too much at stake. They'll do whatever it takes to ensure another silent night.

Mulder, I —

Sh-h-h. Do you hear what I hear?

On the roof. It sounds like ... a clatter.

The truth is up there. Let's see what's the matter ...

Found at The Laffatorium [www.laffnow.com] by the Piano Amateur Radio Klub, and published in their December 1998 Parking Ticket.

Bonds

The US Treasury has just announced that it will sell three new types of bonds:

- The Al Gore bond, which has no interest;
- The Monica Lewinsky bond, which has no maturity; and
- The Bill Clinton bond, which has no principal.

It is not true that they will be issuing an ARRL bond, which has no redemption date.

eHAM.net is Here

They call it e ham dot net, and it could be the beginning of a new way for hams to interact with one another and the world around them.

E ham dot net made its debut in cyberspace on September 2nd. Its creator, Bill Fisher W4AN, says that the site can best be described as a community of hams from around the world interacting as a community.

Fisher says that e ham dot net aimed at giving hams a place to share ideas. This is accomplished on many levels, ranging from simple sales ads to propagation and DX information to a chat area where anything can be discussed.

But that's not all. E ham dot net includes news items from *Newsline* and other sources, a callsign server, free ads to swap on-line with listings automatically exported and reposted to the rec dot radio dot swap newsgroup, and much, much more. Access to e ham dot net is free. To take a look go to [www.eHAM.net].

Thanks to W4AN, via Newsline, *Bill Pasternak WA6ITF, editor.*

The Shorter, the Better

If you are planning on putting on a hamfest or convention, think small. At least if you live anywhere in the southeastern United States, that is, where smaller seems to equate with better.

The realization that small hamfests dedicated primarily to flea marketing and ham radio testing are the most popular comes as a result of a survey conducted by the South Eastern Repeater Association. The results, which are available in the fall issue of its *Repeater Journal*, shows that 60% of those surveyed are more likely to attend a one-day hamfest than any other kind of show. 60% also said that all one-day shows should be held only on Saturday with 72% saying that the starting time should be an early 8 a.m. local time. Least popular are full-fledged conventions with manufacturers' representatives and mega displays. Only 39% said that they cared for these types of shows. Also, an overwhelming 64% said that no matter what kind of show it is, they usually head home between 1 and 2 p.m. in the afternoon.

In the area of forums, radio clinics, and other such activities, 54% of those responding said that these are not important to them. Only 33% attend these activities on a regular basis, with another 36% dropping by once in a while. On the other hand, 79% say that having ham radio examinations available at a hamfest or convention is one of the most important services that a show can render. 62% say that exams should be held in the morning.

The SERA survey covers just about every aspect of hamfest activity and contains many revelations that even industry leaders were probably unaware of. It's reasonable to assume that ham radio manufacturers and publishers will be taking a very close look at the facts that the SERA survey delivers as they begin planning their attendance at shows for the year 2000 and beyond.

Thanks to the Repeater Journal, *as reported in* Newsline, *Bill Pasternak WA6ITF, editor.*

Changes at Dayton

Some major changes are coming to the way forum speakers are reimbursed at the Dayton Hamvention. Until now, forum leaders and speakers were given sixty dollars a day for up to two

Continued on page 38

Big-Time Bench Supply

This highly regulated SCR design might be overkill, but it's still fun to build.

Craig Kendrick Sellen
Mallard Meadows RHC
476 Belmont St., Room 405
Waymart PA 18472

Anyone who works with the latest electronic circuits, whether he or she is a professional or an amateur, will eventually require a closely regulated variable voltage power supply. While most power supplies are regulated directly from the basic rectified and filtered DC input, tighter regulation can be obtained by using a preregulated approach in design.

The preregulated power supply described here can be built for just slightly more than you would have to pay for a conventionally regulated low-current power supply. It employs two inexpensive 723 power supply voltage regulator IC chips in a circuit that can deliver from 3 to over 35 volts DC at load currents up to 3 amperes. The design eliminates the need for massive heat sinks and cooling fans.

Circuit description

The preregulated power supply's circuit schematic is illustrated in **Fig. 1**. It can be diagrammed as an AC source, diode bridge rectifier, and two voltage regulators in series. The preregulator, by means of silicon-controlled rectifier

Continued on page 12

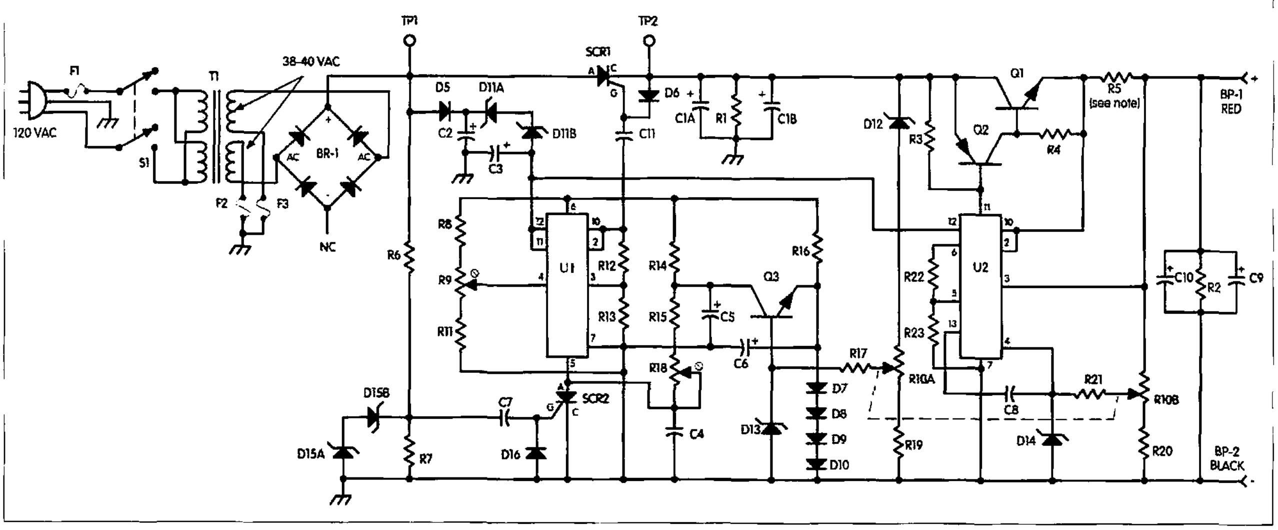

Fig. 1. Circuit schematic. Notes: 1. Mount SCR1 and Q1 on 4 x 2-1/2 x 1-inch heat sink. 2. R5 current limit: 3A — 5W/0.2Ω; 2A — 3W/0.3Ω; 1.5A — 2W/0.4Ω; 1A — 1W/0.6Ω; 0.75A — 1W/0.8Ω; 0.5A — 0.5W/1.2Ω; 0.25A — 0.5W/2.2Ω. 3. A 120 VAC neon panel lamp with built-in resistor can be mounted across the two poles of S1, such that it is on when the switch is thrown. 4. Along the connection between pin 12 of U1 and pin 12 of U2, voltage must not exceed 39 V.

Big-Time Bench Supply

continued from page 10

SCR1, continuously controls the voltage at C1, so that the voltage across Q1 remains at a constant level. The output regulator U2 is a high-performance circuit that is capable of supplying 0.1 percent regulation.

Synchronized to the 120 Hz rectified AC input, preregulator U1 is designed as a time-delayed pulse generator that controls the gate of SCR1, which triggers conduction at the exact point in time required during each half cycle. The bias potential applied to the inverting (pin 4) input of U1 is controllable by trimpot R9. This potentiometer determines the fixed reference level for the supply.

The zener-regulated source at pin 6 of U1 also supplies current through R14, R15, R18, and C4 at pin 5 of U1 (non-inverting input). The current continues to flow until the reference potential is exceeded. At this time, U1

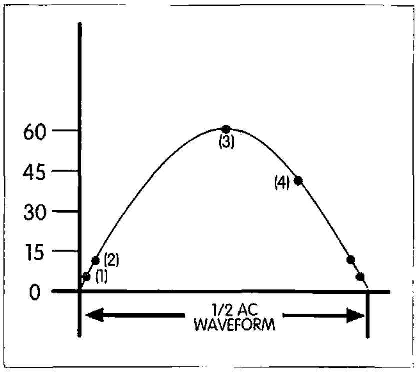

Fig. 2. Y-axis shows SCR anode voltage. SCR event sequence: 1. SCR2 triggers as C7 charges: C4 then discharges and U1 cuts out. 2. D15 limits potential on C7; then SCR2 cuts out and C4 begins to charge. 3. Capacitor C4 has charged above reference level at pin 4 of U1, causing the IC to conduct; a trigger pulse at pin 10 turns on SCR1 through capacitor C11. 4. SCR1 current decreases as capacitor C1 potential increases; when the potential across SCR1 is insufficient to maintain approximately 10 mA, the current through SCR1 cuts out. Note: SCR1 conducts on and off at approximately #3 and #4 on the curve when the output load is drawing 3 amperes at 35 volts. With no external load, events #3 and #4 occur near the end of the waveform, as indicated by the unmarked dots on the curve.

conducts. The resulting square-wave pulse from pin 10 of the integrated circuit is limited to 9 volts by current-sensing resistors R12 and R13, and is sufficient to trigger the gate of SCR1 into conduction.

The RC time constants in the circuit are controlled by the amount of current flowing through transistor Q3, which in turn depends on the voltage error present at the R10A wiper. Resistor R16 and diodes D7 through D10 make up a voltage divider that applies a constant 2.4 volts to the emitter of transistor Q3, so that when the base of Q3 goes above 3 volts, that will present a voltage drop across resistor R14 and a corresponding change in the RC time constant. C5 and C6 provide stability for the proper operation of Q3 to prevent SCR1 from triggering erratically. When the wiper of R10 is rotated CCW, R17 and D13 prevent damage to Q3 and D12.

The method of synchronizing U1 to the rectified supply input is illustrated graphically in **Fig. 2**. Triggered into conduction by the positive-going voltage waveform, SCR1 cuts out when the gate voltage stops and capacitor C4 discharges sufficiently to reduce to a minimum the holding current to the SCR. The diagram also reveals why the secondary voltage from T1 must be greater than would be normal in a conventionally regulated power supply. The SCR cannot conduct until its anode is more positive than its cathode. Simultaneously, a minimum latching current must flow as well. Also, SCR1 must remain conducting until the energy drawn from capacitor C1 by the output load is replenished.

Since the voltage across capacitor C1 will be about 40 volts at maximum output load, the 18-volt difference allows the time interval necessary for maximum current. This also means that SCR1 triggers only near the peak of the waveform or on the negative-going side of the waveform. The minimum holding current required by SCR1 is supplied by bleeder resistors R1 and R2.

The dual potentiometer R10A and R10B establishes feedback to both IC voltage regulators. R10A and R10B should be evenly matched, so a wirewound potentiometer is used between the two regulator sections. This is done so an identical voltage is always present across each section of the pot. The wiper voltages should be very nearly the same at any setting. The potentiometer R10B section samples the output voltage and directs U2 in the proper direction to maintain 3 volts between the wiper and ground. The R10A section samples the voltage across capacitor C1, controls the triggering of SCR1, and also maintains 3 volts between the wiper and ground.

Since the voltage at the CCW ends of R10A and R10B have to be the same, the voltage across capacitor C1 will be 6 volts higher than the output because of the effect of D12. Any change in the output voltage and/or current will affect the triggering-pulse timing at the gate of SCR1, maintaining a constant voltage across transistor Q1.

Testing and alignment

To compensate for component tolerances, U1 has to be initially aligned. To accomplish this task, you will need the use of an oscilloscope, high impedance DMM, and an improvised load on the output. Rotate R10 CCW, and set trimpot R18 to maximum resistance and trimpot R9 for maximum voltage gain at U1 (pin 4) before turning the power supply on. Connect the oscilloscope between TP1 and ground. Also connect a DMM between TP2 and ground. Then apply power to the supply. Now a small voltage should appear at TP2, but the oscilloscope should show that SCR1 is not conducting. Keeping the voltage reference level as high as possible at pin 4 of U1, adjust R18 and R9 until SCR1 triggers at a regular rate and the DMM shows 9 volts at TP2. When R10 is rotated completely clockwise, the DMM should show 40 volts at TP2. Place a jumper wire across R5, temporarily shorting it out, and then momentarily place a 12 ohm 150 watt power resistor or some other parallel combination equivalent across the supply output connected to BP1 and BP2. If the TP2 reading on the DMM decreases more

than 0.2 volt, or if SCR1 triggers intermittently, then adjust R9 only enough to correct it. Then, with the load resistor (12 ohm) removed from the output, rotate R10 CCW. The DMM reading at TP2 should slowly decrease to 9 volts. If it does not, adjust trimpot R9 for a higher voltage at pin 4 of U1 until it does.

Rotate R10 once again and apply the load, compensating for the voltage decrease by adjusting trimpot R18. There will be some combination of the two adjustments that will allow transistor Q3 to hold control over U1 throughout the specified current and voltage ranges. To achieve this, transistor Q3 must always be forward biased; if at any time Q3 does not draw the proper current through R14, it has lost control.

Correct alignment will be accomplished when the voltages at the wipers of R10A and B are the same at any output setting. To test this further, connect the DMM across transistor Q1 and note the voltage change when R10 is rotated clockwise. Any difference should correspond with zener diode D12's voltage characteristics at bias currents between 1 and 7 mA.

Parts List			
Semiconductors			
U1, U2	LM723 voltage regulator IC, RS #276-1740	D11	Two 10 V 1 W zener diodes in series (1N4740A)
Q1	2N3055 NPN transistor	D12–D14	6 V 1 W zener diode (1N1509) or (1N5233B)
Q2	2N4919 PNP transistor #526-NTE 185	D15	Two 3.9 V 400 mW zener diodes in series (1N4730A)
Q3	2N2222 NPN transistor	BR1	100 PIV 5 A bridge rectifier
D5	100 PIV 1 A silicon rectifier diode 1N4002	SCR1	#526-NTE 5463
D6, D7–D10, D16	1N914 or 1N4148 general purpose silicon diode	SCR2	#526-NTE 5400
Resistors — All resistors are 1/2 W 5% unless otherwise noted			
R1, R2	1000 Ω 5 W 10% wirewound	R12	120 Ω
R3, R21	680 Ω	R13	1800 Ω
R4	Two 12 Ω 1/2 W in parallel	R14	3300 Ω
R5	0.2 Ω 5 W wirewound	R15	Two 150 kΩ resistors in parallel
R6	4700 Ω 1 W	R17	1500 Ω
R7, R16	4700 Ω	R18	50 kΩ 10T miniature PC trimpot
R8, R11	3900 Ω	R19, R20	470 Ω
R9	5000 Ω 10T miniature PC trimpot	R22	4300 Ω 1%
R10	5000 Ω dual wirewound potentiometer	R23	3200 1%
Capacitors			
C1A, C1B	Dual 5000 µF 75 WVDC electrolytic can	C7, C8	0.001 µF ceramic disc
C2, C3	100 µF 75 WVDC electrolytic	C9	1000 µF 50 WVDC electrolytic
C4	0.05 µF ceramic disc	C10	1 µF 50 WVDC tantalum electrolytic
C5	100 µF 16 WVDC electrolytic	C11	0.01 µF ceramic disc
C6	33 µF 16 WVDC electrolytic		
Other Components			
T1	120 VAC dual primary, 38–40 VAC dual secondary at 3 A transformer	S1	DPST switch (power)
F1	2 A slo-blo fuse with panel mount holder	BP1, BP2	5-way binding posts (1 red, 1 black)
F2, F3	3 A slo-blo fuse with PCB clips	TP1, TP2	Panel-mount test points

Table 1. Parts list.

Secret Death Ray

Or is HAARP a useful science tool?

Donald Koehler N7MGT
4819 E. 6th Ave.
Anchorage AK 99508-2317

The title of this article sounds scary, but a quick search on the Internet will reveal sites with headlines about the High-frequency Active Auroral Research Project — or HAARP — that are almost as scary. To this long-time electronics technician with extensive RF experience, some of the initial reporting about the system seemed, well, just a bit sensational. In the past, this and other magazines have featured articles on the system and site that all had a common thread: The author had never been to the site in question.

Even the Alaskan author of the infamous book *Angels Don't* ... has never been to the site. So, my wife and I did something most writers about the HAARP system have failed to do — we drove up to the site and looked things over.

The government liaison to the site is a ham himself, and we set up a time when we would both be open to visit. He has helped to get several listening tests produced — more on this later. The HAARP site is located just over 150 miles north of Anchorage. It was a very pleasant three-hour drive on a cold, sunny day in the winter of '98 to get to the site for a visit. We had arranged to be on site just before the start of the first listening test.

The site was easy to find due to the large — and empty — generator building found on site. The location had originally hosted a "Relocatable Over the Horizon" radar system for the US Air Force, but now it is used by scientists to study the upper atmosphere.

Given that the system has been granted almost cult status as, among other things, an ultra-top-secret CIA-operated mind control device, we were surprised to find no discernible physical security. For example, the gate to the site was open and deeply buried in snow, so even to close it would have

***Photo A.** Classic view of the HAARP antenna field. Transmitters are housed in the large white vans.*

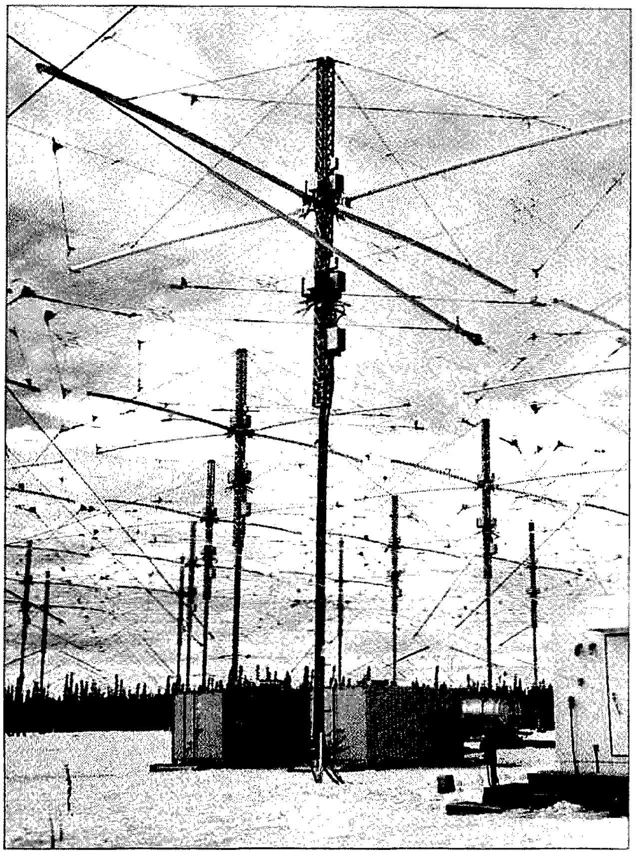

Photo B. *Close-up view of the antenna field. Note the ground counterpoise for the antennas to "steer against."*

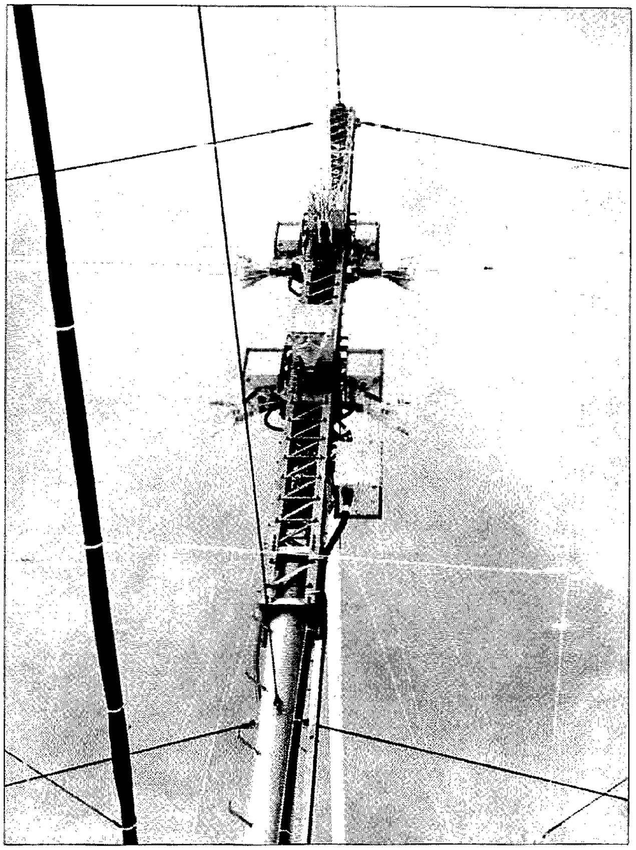

Photo C. *Detail of the phasing elements on the antenna towers; the antennas and their feed are phased for directional control.*

required a lot of digging. Little matter, as the snow was over the top of the fence and you could walk in anytime, anyway.

As we drove farther into the site, we found a couple of small buildings and a cluster of older mobile homes. After a quick look around, we found a small "Entrance" sign by a door and made our entrance. The door was unlocked, by the way. We wandered around for several minutes calling loudly — and finally made contact with Ed, the ham (and government agent) we had talked to in setting up the visit.

He gave us a complete tour of the site, opened every door we asked him to, and allowed us to photograph anything we desired. I worked in classified areas while in the military, and I can tell you that this HAARP site had nothing that could even remotely be considered classified. So much for the "mind control/doomsday box" myth.

What we did see was straightforward, high-power HF transmitters and

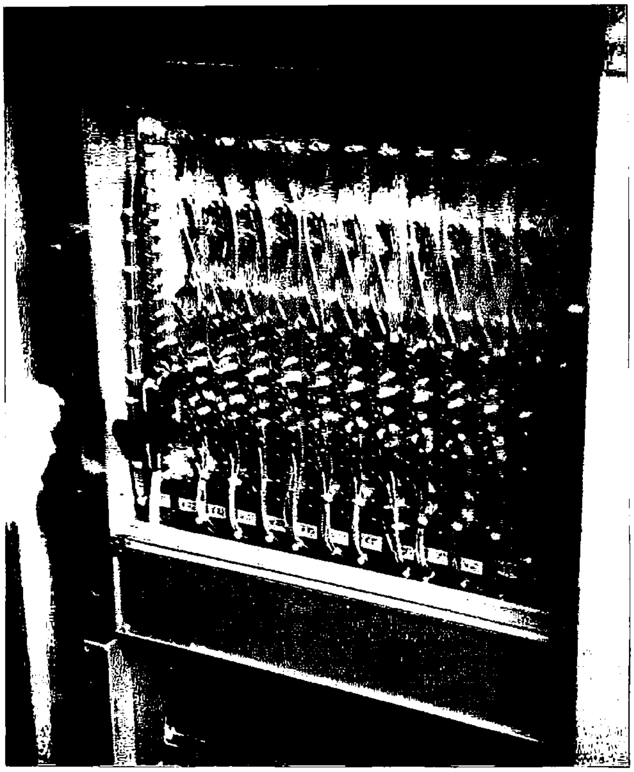

Photo D. A control panel: this unit controls the phase of the feed to the antenna set.

Photo E. Mary examines power pentode and finds no markings in Klingon — just Varian.

the electronically steerable antennas — the same view, by the way, that you can find on the HAARP Web site.

My wife Mary has an abundance of common sense. While not technically oriented, she can smell a rat a mile away. She gave these guys a clean bill of health. I have a 30-year background in electronics and a B. Sci. degree, and have spent a lot of years working on very high-end military electronics. What I saw here was a site devoted to science, funded in part by the Navy.

The site does contain several instruments of value to hams. These are the current recording riometer and a "waterfall"-type spectrum analyzer, both of which will allow you to keep track of the ionosphere from the Internet. It also has a running "snapshot" of the received signal levels for WWV on 15 MHz and 20 MHz, as well as the 49 meter SW broadcast band. All very useful. Find these at [nrl.navy.mil/projects/haarp/index.htmlhttp://w3] and, specifically, you can find more information on the ionosphere at [http://w3.nrl.navy.mil/projects/haarp/ionindex.html]. For fun, they have a Webcam on site. You can see the current daytime weather in interior Alaska.

The site has a variety of other sophisticated RF test equipment — all of which can be accessed via the World Wide Web. The settings of the equipment are controlled via a computer bus, but the readings are available for your use. In addition to the RF test equipment, a recording magnetometer is on-site to track geomagnetic disturbances that may impact the ionosphere, which has a direct affect on propagation. While not a complete tool for hams in the CONUS, it is a solid

Photo F. Off-the-shelf PCs are used to control the system and test equipment.

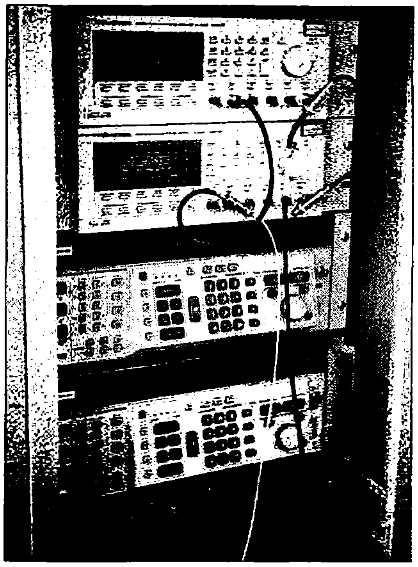

Photo G. Some of the HP test equipment used on site to monitor the signal produced by HAARP.

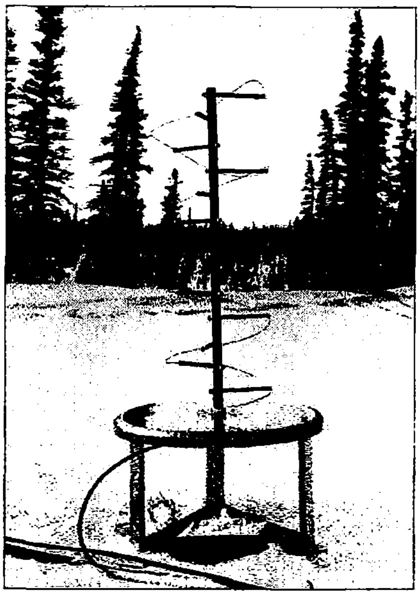

Photo I. Another antenna used in the science package found on-site.

place to gather data to compare to other information sources focused on the CONUS.

What impact does the site have on propagation? The site has sponsored several listening tests for hams — with spotty results. Hams in Alaska have been able to hear the site, and hams outside of Alaska seem to have had limited luck in bagging it. Even when the site is in operation — for a campaign — I have noticed no effect to received signals here at my station. There is a greater impact to my station operations from auroral flutter than anything the HAARP site has produced to date.

Once and if the site gets the funding to increase their power, I may have to revise this observation. The HAARP folks publish their transmission schedule in advance, so you can check with their Web page to discover their transmit times and monitor on your own — before, during and after the test. An HF beacon station or WWV would be best to listen to — I can't tell any difference, but perhaps you can.

The bottom line, after visiting the site, performing near-field RF level measurements, and talking to the operators and

Continued on page 37

Photo H. Antenna field used to support riometer. This instrument will give a very good feel for the state of the ionosphere.

NEVER SAY DIE

continued from page 4

The head of the Rensselaer School of Management loved the idea and wanted to implement it. The next thing I knew, he'd inexplicably left.

Tumors

No matter how much the mobile phone industry hates it and is in public denial, two new studies have shown a clear connection between mobile phone use and brain tumors. Dr. Hardell, in Sweden, has shown that there is a 250% increased risk of a brain tumor for mobile phone users. The situation is even worse for children and young adults, where their cells are growing faster than in older people and are thus more susceptible to radio wave energy interference in their reproduction.

Dr. Preece, of Bristol University, found that a 20-minute use of a mobile phone changed people's ability to make choices that involve the visual cortex, the part of the brain which processes sight.

Dr. George Carlo, who worked for six years on a $25 million cell phone industry study, went on an ABC News report recently saying that there were two types of risk from using cell phones near the head. One is genetic cell damage and the other is tumor formation. To industry claims that scientists have found no direct evidence of risk, Dr. Carlo said that that was "actually quite shocking ... knowing what has been conveyed to them."

If you are still using a cell phone, keep it short. Better yet, use the bag type with an antenna on top of the car.

If you have been convinced that your HT or a cell phone held up next to your head can't do any harm, you're another victim of a con job. Ditto if you believe the power company propaganda that magnetic fields from their power lines and distribution transformers are safe.

We are fortunate that the leading researcher in the world in this field is W. Ross Adey K6UI. Ross has been fighting the power and cell phone industries, trying to let people know the facts. But the money, and therefore the media attention, lies with the affected industries. There is no constituency for safety. So money, as usual, rules, in the media and with government agencies.

If you're interested in reading Ross' testimony before Congress on the subject, I've reprinted it for you. His testimony is backed up by his years of research, plus that of dozens of other almost unknown researchers.

Yes, cell phones are causing brain cancer. Yes, police radar is causing brain cancer, as well as testicular cancer, where officers rest the radar gun in their lap. Yes, kids are getting leukemia from power lines and transformers. Kids are particularly vulnerable because their cells are replicating faster than in adults, so the influence of magnetic fields on their cells is more evident.

Yes, microwave and UHF energy will affect your cells, and not for the good. It's not so much the microwave energy itself that's doing the damage, but the modulation.

Sure, your car will run fine if you only put a little sugar in the gas tank. At least for a while, but if you keep doing it, eventually the engine is going to stop. It's the same when we are poisoning our bodies, whether it's with sugar or magnetic fields.

Send me $3 for the reprint of Ross' Congressional testimony so you'll have the facts (see page 63, item #34). It's powerful stuff, but it's being lost in the blizzard of power and cell phone industry PR dollars.

Capitalism

The capitalist system seems to work pretty well. Well, it does as long as there is competition. But when some outfit manages to put its competitors out of business so it has a monopoly, the pressure to keep prices low and service high tend to disappear. In egregious cases, the government steps in and we have an anti-monopoly court battle, such as we've seen against Microsoft, and we've seen with AT&T and IBM.

If Congress ended the post office's monopoly they legislated on handling the mail, we'd see prices dropping and service escalating. Look at the computer field, where prices have been steadily dropping, while the product has been improving by leaps and bounds.

Then there's the school monopoly, where the teacher's unions are fighting hard, spending millions on lobbyists and deceptive advertising to prevent competition from charter schools or vouchers, and doing their best to make home schooling as difficult as they can.

How about the medical monopoly, with the AMA and the pharmaceutical companies in bed with the insurance companies and the FDA, providing us with the most expensive medical care in the world (by a wide margin), and one of the least effective. And all of this is with the connivance of Congress.

Our government is a typical example of a monopoly, with the price of its services going ballistic, and the quality of service into the pits—with the IRS pit bulls.

Lost & Found

A toddler who got lost in the wilds of northern New Hampshire was found by a woman who dowsed a topographical map. Her help was ignored by the search officials, but the state Fish and Game officers were persuaded to take her seriously and the child was found within the small circle she had drawn on the map.

A retired judge who has been dowsing for 35 years has found over 4,000 wells, seven missing persons and 150 missing pets. Another dowser has had 90% success in finding long-forgotten grave sites for descendants looking for their ancestors.

But then, if you are a skeptic, it's because you haven't read the books by Owen Lehto, Chris Bird, and Bevy Jaegers that I've reviewed in my *Secret Guide to Wisdom*. A good dowser can find anything, whether you believe in it or not. Further, this is a skill that just about anyone can develop.

Frustration

While it's fun being a guest on the Art Bell (W6OBB) radio talk show, I feel something like Ponce de Leon would probably have felt if he'd actually found the Fountain of Youth he was looking for all over Florida. "Hey, I've found the Fountain of Youth!" To which his audience would say, "Sure you have," as they went back to whupping slaves and pickin' cotton, or whatever.

About one out of every thousand Bell listeners gets in touch with me. Of those, about one in ten actually sends for my *Secret Guide to Health*. Considering that most catalogs pull about a 1% response, with 2% being considered outstanding, I should rejoice at 10%. But I'm greedy — not for sales of my book, which, for $5, is pretty much an at-cost item, but greedy in that I want to help more people to live longer, healthier happier lives.

Yes, I really have discovered the Fountain of Youth. It took several years of research, mainly because our so-called health care industry has done such a magnificent job of hiding the brilliant work of a few doctors. Plus, there's the political might of the pharmaceutical industry, the insurance industry, Big Tobacco, Big Food, Big Sugar, Big Chemical, and other Biggies to keep the truth from being known.

The nice thing about reading books is that they make it possible to learn from the world's top experts, instead of from some pontificating professor who is far more interested in research grants than those blank faces in his lecture hall. Or from some grad student "teacher" who doesn't know squat. As I've mentioned,

in my four years of college I had exactly one interesting teacher. The rest were busy repeating what they'd been taught a generation earlier. For instance, the subject of quantum mechanics was never once even mentioned in any physics class! And this was in the 1940s in an engineering university!

Oh, I can understand why 99.99% of the people hearing me would be skeptical. What I've learned goes counter to what they've been taught to believe from earliest childhood. We *believe* in doctors. In hospitals. In chemotherapy and radiation for cancer. We *believe* that the standard medical approach to dealing with arthritis, diabetes, and so on *must* be right. So who is this Wayne Green guy who is trying to say that this is all horse pucky? Who's this guy who is trying to tell us that merely by changing our lifestyle we can get over virtually any illness and add 30–60 years of healthy living to our lives? What a crock!

I'm open to any ideas you may have as to how I can get the attention of the 99.99% of the people who need help, but are blind and deaf to my message.

I feel a terrible sadness when I see some bloated elephant of a woman heading for an all-you-can-eat buffet for her fifth plate. I feel it when I see hams at Dayton with grotesque bellies hanging over their belts. Or people hobbling along with walkers. When I visit nursing homes and see rows of Alzheimer's veggies.

It wasn't until I did the research that I found out what's gone wrong. Like everyone else I was busy poisoning my body with caffeine, mercury, root canals, NutraSweet, tons of sugar, and so on. I had no way of knowing what a sucker I was. I ate coffee and doughnuts at ham club meetings. I loved the free doughnuts the Dayton HamVention provided in the exhibitors' lounge. Now I'm busy doing everything I can to repair the 70-some years of damage I've unknowingly done to my body. It's quite a reconstruction project.

Have you some suggestions on how I might go about increasing the percentage of people I'm reaching with my message from 0.01% to maybe 1%?

Oh, Fig!

The Cleve Backster experiments with his philodendron that were reported in *The Secret Life of Plants* almost 25 years ago were recently replicated using a fig, as reported in the Spring issue of *The American Dowser*. A freshly picked fig was placed between two electrodes that were connected to a galvanic response recorder. When someone decided to cut the fig, as he reached for a knife the fig responded with a large pulse. Feeling sorry for the fig, he put down the knife, which resulted in a shorter galvanic pulse from the fig.

When the fig was asked if it could be eaten there was only a very tiny response. It didn't seem to mind.

Apparently distance doesn't make any difference, as reported by Backster. This was confirmed by Marcel Vogel, a senior research chemist for IBM's Advanced Systems Development Laboratories, who sent strongly focused thoughts to a plant in California from Czechoslovakia.

This would seem to be a wonderful area for exploration by kids looking for interesting science fair projects.

Good News!

One of the more valuable books reviewed in my *Secret Guide to Wisdom* is Chris Bird's *Secrets of the Soil*, which is a barn-burner. Unfortunately it's been out of print, so when I got word from the ASD Bookstore, 430 Railroad St #1, St. Johnsbury VT 05819, (800) 711-9497 (Wayne sent you), that they have the book in stock, that was great news! It's $20. The 442 pages are packed with fascinating information, much of it stuff you won't find anywhere else. If you're looking for interesting fields to experiment in or for a new product to sell, you'll find this a treasure.

As a matter of probably no interest whatever, the old name for St. Johnsbury was Sanger's Mills. My middle name, which my dad used, so I didn't, is Sanger. My great-great grandfather came over from Vermont to New Hampshire around 1820 and settled in Littleton. My great grandfather Sanger was a homeopathic physician — the town doctor.

But don't let that stop you from reading this amazing book, okay?"

More Bad News

A fax from WAØKKC says that the local hamfest attendance as well as the exhibitors, both commercial and individual, were off at least 40% from last year and that 95% of those attending were old men. It looked more like a Social Security meeting than a hamfest. And who was everyone blaming? The ARRL! You can bet that many of the attendees and exhibitors won't be back if they try to run another hamfest next year.

Unless you are able to get your director to stop trying to discourage youngsters from getting involved with the hobby, we're goners. Demand that your director come to a club meeting and

Continued on page 20

Never Say Die

continued from page 19

explain why he has done nothing to get the ARRL to promote the hobby.

When I got involved with amateur radio the average ham age was 28 and thousands of schools had radio clubs that were busy recruiting new blood and getting them licensed. The League, under the secret leadership of Mort Kahn W2KR, almost totally destroyed the school club infrastructure in 1964, and it's been downhill for us ever since.

How bad is it? I gave a talk to a ham club near Boston, and I was the youngest guy in the place.

Criminals

A recent Danish report (no, not the pastry) of a survey of 4,169 34-year-old males found a close correlation between their mother's smoking during pregnancy and their later persistent criminal behavior. The more the mother smoked, the more later criminal behavior.

Using Your Head

As A-Team's George Peppard used to say, "I love it when a plan comes together." Well, I feel like a physicist who's just developed a Theory of Everything, tying all the forces of nature (God?) together into one equation. Einstein's goal. Only this is a mental Theory Of Everything and it can, if you'll use it, change your life. And all it takes is five minutes a day! With an enormous amount to win and nothing to lose, I hope you'll put aside your usual skepticism and give this a try.

Each of the pieces of the puzzle has been making sense. For me, it's been something like putting together a huge jigsaw puzzle (which I love to do — particularly the wooden ones!). But, unless you've been reading the books I've been reviewing in my editorials, then recommending in my *Secret Guide to Wisdom*, and thus keeping up with the research I've been doing and the amazing things I've been discovering, you'll probably have a problem with accepting some of the jigsaw pieces I've fitted together.

For instance, one piece of the puzzle started with *The Secret Life of Plants*, where Chris Bird reported on Cleve Backster's research into plant-human communications, where plants were somehow able to sense what people were thinking. Then there was J. Allen Boone's *Kinship of All Life*, which explained how we can communicate with any animal, and even with insects! In Chris Bird's *Secrets of the Soil*, he explains that farmers have been able to get insects to leave their crops alone just by communicating with them.

I told you how I called Chris to find out what Cleve had been doing since the 1976 plants book. Chris put me in touch with Cleve, and he, in turn, steered me to Brian O'Leary, who had been working with him on human cells. Brian sent me *The Secret Life of Your Cells*. Wow! This book confirms that every cell in our body is in instant communication in some way with every other cell. And that's even when they're separated by thousands of miles! Well, this sure helps to explain the many weird reports from people with organ transplants, and even with blood transfusions and all those twins-reared-apart weirdness.

I've reported just recently on Neil Slade's book, *Mental Magic*, but I haven't yet included it in my *Secret Guide to Wisdom*. In it Neil explains how you can get clouds to change their shape, just by willing it. No, it doesn't work every time, but it does often enough to convince anyone who doesn't have a totally closed mind. It's a piece of the puzzle.

In *Secrets of the Soil* Chris discusses the power of thought (prayer) to influence the growth of seeds as well as plants. Prayer also is well known to help sick people to get better.

Then there's the work of Coué (1857–1926), who had millions of people telling themselves that "every day in every way I am getting better and better." The trouble with that was that it worked, much to the consternation of scientists, who in general don't want to have anything to do with the power of thought.

Scientists in general also don't want to know about the work of J.B. Rhine at Duke University, where he proved that thought can influence matter. This was recently proven again by the PEAR Lab at Princeton, and further confirmed mathematically beyond question by Dean Radin in his *The Conscious Universe*.

After Art Bell had Neil Slade on his show, Art decided to test the power of his audience's thoughts. At the time Texas was dry as a bone, with wildfires raging. He asked his listeners to pray for rain for Texas. Almost immediately Texas had a record downpour, which not only put out the fires, but flooded wide areas.

Art tried the experiment again when Florida was suffering from hundreds of fires, burning tens of thousands of acres. The resulting rain damned near floated Florida out into the Gulf. Art has wisely stopped the experiments.

You see how the pieces of the puzzle are starting to fit?

Next came a letter with a tape from a listener who enjoyed hearing me on

Art's show. The tape explained how you can make major changes in your body just by positively communicating with it. You start out by standing naked in front of a full length mirror. The most difficult part is telling each part of your body that you love it. Tell your arms that you love them. Tell your tummy the same thing. Your head. Your feet, and so on. Tell every part of your body that you love it. Then, every day, devote about five minutes to gently massaging each of your body parts, reaffirming your love.

Well, before you dismiss the idea, consider how cooperative someone you know would be if you let them know every day how much you hated them. You may hate having a big fat gut, but tell it you love it anyway. Tell it that every day. Then you'll see a miracle start to happen. You'll start losing interest in eating that bowl of ice cream. Or that slice of coconut custard pie. You'll be looking for a salad bar instead of the usual McDonald's trough.

After the trauma of my first divorce I started losing my hair. I've never really thought much about it. I haven't hated how I look, but then I sure haven't been proud of it either. One part of my body affirmation will be my love for my head of hair. Hey, and while you're about it, head, how about darkening some of that growing gray? My father and one grandfather had plenty of hair at my age. Dark hair. My mother's father's hair turned white and thinned out when he was young, so maybe I can trigger my father's genes? I've nothing to lose.

One thing I guarantee: If you follow through every day (not three times a week), you will see some amazing changes. Make notes and let me know, okay?

One more piece in the puzzle dropped into place when I heard the July 8th Art Bell show. He was interviewing Dr. Laura, who looks less than half his age. He just isn't aging. He explained that every cell in your body is in constant communication with your mind, so what you think of yourself comes across as orders from the boss. So, if you think you are ugly, you are going to be ugly. If you hate your fat body, you're on your way to being mistaken for a Goodyear blimp. If you have been convinced you are stupid, guess what?

Doctors and scientists like to think of the mind and body as separate. They aren't. Every cell in your body is part of your mind. Every cell is in communication with every other cell. Backster and O'Leary proved that.

Back when I first started writing editorials, almost 50 years ago, I explained that every physical illness had a mental component, and that if doctors would find it and decondition it, the illness would go away. No pills. No surgery. No shots. No return office visits. No further income.

When personal computers came along 25 years ago I explained in my computer magazine editorials that doctors needed a program which would help them isolate the contributing mental component of illnesses. Using a sensitive ohmmeter circuit, it would be simple for a computer to isolate the triggering mental component so the doctor could decondition it. As a mental repair technician 50 years ago I had no problem isolating these mental triggers and eliminating them, just by asking a few questions — and people would immediately get better!

Even Walt Disney has tried to get us to understand the power of the mind to improve our lives. One of my favorite songs is *When You Wish Upon A Star*, from *Pinocchio*. "When you wish upon a star, makes no difference who you are, anything your heart desires will come to you." The song has a powerful message — if you take it seriously. I did a short segment on a recent [www.rainreport.com] where I sang the song. I'll bet that surprised the heck out of anyone who listened to it.

This also explains how and why placebos work so well. If we believe something is going to work, our cells are going to take care of things from there on.

If you are still in denial over your ability to communicate with plants, insects, animals, and your body, I hope I can convince you to go the $5 for my *Secret*

Continued on page 48

TV Tutor

How to get started in SSTV.

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It's the usual story. You look at some activity, and you think, "I would like to get into that, but where do these guys hang out?"

The first thing is to get hold of a program. Your ATV group may hand out copies of EZ SSTV, which is a good start. If you are on the Web, try entering this for a site (called URL):

[http://www.ultranet.com/~sstv/]

One of the clickable buttons gives you a list of programs for downloading. Most of these are shareware. They will work, but your transmission will show "UNREGISTERED," or something similar, in the header. Registering is not expensive, and you may get worthwhile support and updates.

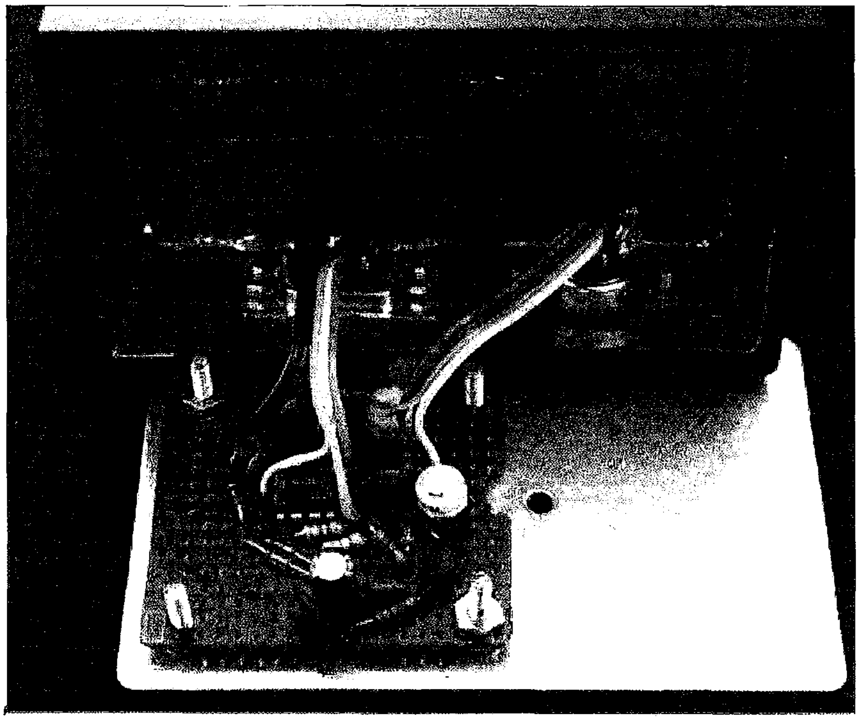

Photo A. Author's home-made UART.

The programs need decompressing after downloading, for which you need PKUnzip. There are different versions of PKZip (containing PKUnzip) for DOS, Windows 3.11, and Windows 95/98. Download also the instructions for your choice, and read them. Each version installs and works differently. If you cannot delete all the components of a PKZip installation that you stuffed, you may have to re-install Windows. Been there, done that. On the Web, try:

[http://pkware.com/shareware/]

You may need an interface. As a rule of thumb, for a 486 computer or better, but without sound card, choose one of the DOS programs. Some programs need a Hamcomm interface.

For reception, this uses an op amp to boost the receiver audio to RS232-compatible levels, which are typically ±12 volts. For transmission, there is a low-pass filter. The serial port must use a "Universal Adapter for Reception and Transmission" (UART), because it is

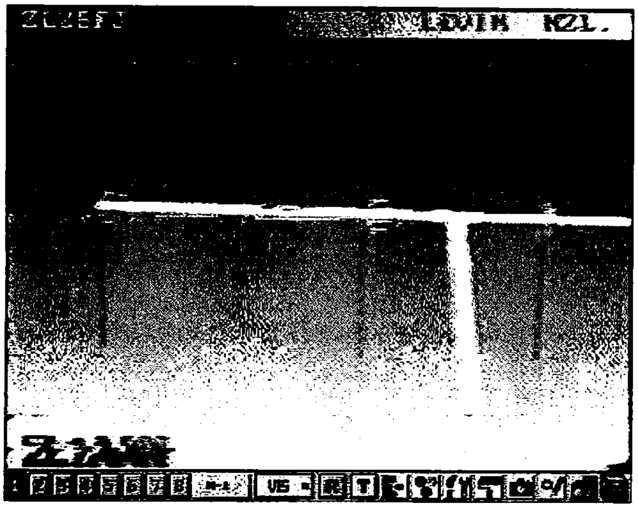

Photo B. A very simple control screen, with one of my pictures after it was-retransmitted back to me.

used as an analog-to-digital converter for reception, and as a digital-to-analog converter for transmission. Most IBM clones have a standard UART chip, but a friend found that his computer did not. The programs I have seen contained two circuit diagrams for this interface. I built mine on Veroboard in a box (**Photo A**).

Since with the Hamcomm interface the computer does all the work of moving pictures between the radio and the screen, some programmers, like the author of JVFax, gave the job of converting between analog and digital signals to an external interface, such as the JVF2. This interface also allows reception of weather satellite pictures direct. But it is getting hard to obtain, and there is a reason.

An increasing number of programs, both for weather satellites and slow-scan television, now use the computer sound card, preferably Soundblaster-compatible, for conversion between analog and digital signals. At a recent talk, Ian Ashley ZL1AOX said that most of these work, but some don't. He says that the main problems occur with laptops. If you are buying a new computer, try before you buy.

SSTV programs contain the information necessary to get going, in the form of at least one manual. You can get something on the screen after just loading the program, but you do need to know how to connect the computer to the radio, and how to get the pictures in step with your particular computer.

There is one series of programs with automatic synchronization that use DOS and the Hamcomm interface. These are EZ SSTV and Pasokon. EZ SSTV is a free, stripped down version of Pasokon, which has additional features worth getting. All you have to do is to receive a succession of pictures until the program tells you, it has sorted itself out.

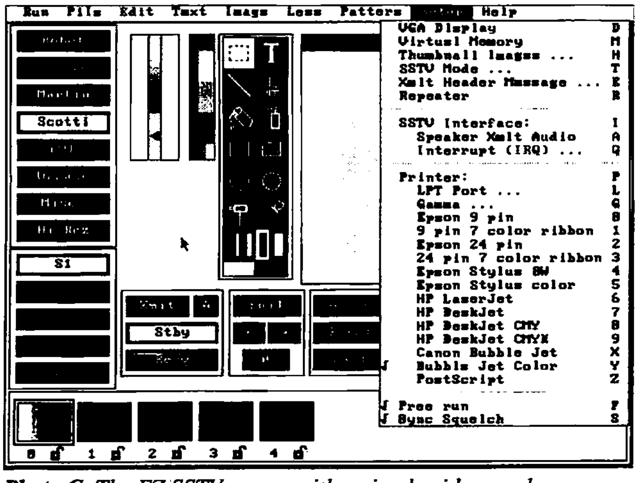

Photo C. The EZ SSTV screen with a simple video card.

The pictures are received and transmitted line by line, and each line has to start on the left of your screen. The program might look for the transmitted "sync pulse" at the beginning of each line. Unfortunately, many noises and clicks on the HF bands sound just like synchronization pulses. To get around this, SSTV programs use the computer clock instead. With computers now in use, their clock speeds vary between 66 MHz and 400 MHz, so your program needs to find that clock speed in the first place.

Without "synchronizing the program," you may be able to receive pictures with some programs, but not with others. When transmitting, however, your picture may be so badly slanted that your recipients may not even be able to tell you what is wrong. The motto then is, "If nothing else works, read the manual."

I don't use Windows programs myself, but I am told that all of them need synchronizing manually, by adjusting the slant of pictures received. I understand you need to press an OK button when you are satisfied, so you don't have to do the job each time after switching on the computer.

Another problem area appears to be the sound levels going to and coming

Continued on page 37

Why Not Renew On-line?

Here's how to untangle the FCC Web.

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If it's getting close to the time for you to renew your ham license, you'll find that you have more choices available to you now than the last time you filed. This time you can renew on-line. And you can do this within 120 days prior to the expiration of your license. As you may know, the FCC has been doing some consolidating of its many forms, and the old familiar 610 is going away. Even though amateur radio is not currently part of the new Universal Licensing System (ULS), the FCC does plan to implement the Amateur Radio Service as part of the ULS. You can read more about this at:

[http://www.fcc.gov/Bureaus/Wireless/News_Releases/1998/nrwl8040.html] and [http://www.fcc.gov/wtb/uls/].

Meanwhile, the FCC does have a new form, the Form FCC 605. It replaces several existing forms, including the 610, 610R, and 610V. As of this writing though, the old familiar 610 was still available on-line. You can download the Form FCC 610 at [http://www.fcc.gov/Forms/Form610/610.pdf].

If you use this form, you should renew no sooner than 90 days before expiration of your license. But let's face it, the whole idea behind the Internet is fast communications. So instead of downloading a form and filing it by mail, why not just do the whole process all on-line. You should note that once your license has expired, you couldn't use the Form 900, even if your grace period has not yet expired. Currently, our grace time is a very liberal two-year filing period.

If you're good at following links and have some time to kill, you might just want to start at [http://www.fcc.gov/], the FCC home page. From there you can follow the various links to the help forms, download pages, and on-line filing. But to save a little time, you might want to follow this article to speed the process up a bit.

A few minutes on-line, and you're covered for another 10 years of exciting hamming.

One of the first pages you'll want to stop at is: [https://svartifoss.fcc.gov/prod/efpa/forms/900/900_Help.htm]. Here you'll find the instructions for filling out the Form FCC 900 over the Internet. Print this out first and have a copy in front of you when you are ready to file on-line. Also, as you visit some of the FCC pages you might want to download some of their other documents. Since the FCC has added pdf as one of the formats it supports for some documents posted at their Web site, you should read about the Portable Document Format (.pdf files) at [http://www.fcc.gov/pdf_ref.html]. This page also has a link for you to download a reader in case you don't already have one installed.

As for the actual filing, the FCC has provided links to their Form FCC 900 for electronic filing. To file on-line with form FCC 900, just connect to [http://www.fcc.gov/e-file/]. From here you can choose from two modes. There is both a normal mode and a secure mode in which to file. Just follow the links License Renewal (Form 900)/ Normal Mode or /Secure Mode.

Choosing the normal mode link will take you to [http://svartifoss.fcc.gov:8080/cgi-bin/ws.exe/prod/efpa/forms/900/900_Form.hts].

The Secure Mode links to [https://svartifoss.fcc.gov/cgi-bin/ws.exe/prod/efpa/forms/900/900_Form.hts].

Should you find these links to be bogged down by the millions of people following this article, you can also get to the FCC 900 form via this FCC link:

[http://www.fcc.gov/wtb/electcom.html].

Here, under the heading of Electronic Forms, the following two sites (Site #1 and Site #2) also point to the form. The first is actually a repeat of the path I just mentioned above, and both seem to be secure connections to the form:

[https://svartifoss.fcc.gov/cgi-bin/ws.exe/prod/efpa/forms/900/900_Form.hts] and

[https://gullfoss.fcc.gov/cgi-bin/ws.exe/prod/efpa/forms/900/900_Form.hts]

If you're not sure when your license expires, you can still use this site to receive that information, too. Simply enter your callsign and click the "Continue" button. You'll receive a message similar to this one if it is too early:

Callsign AC3L expires on Jun 8 2009 11:59:00:000PM, it is too early to renew.

If you are within the renewal period, you'll be shown the Form FCC 900 on the screen. You should follow the instructions you've printed out and answer the appropriate questions. With the instructions in hand, you should have no problem filling out the form. The only area I had a problem with was block #14. It asks for a signature, but all you need to do there is type in your name. It's really a very easy process to renew. You should also note that you're allowed to use this form for changing your mailing address at the same time. Just enter your new address in item #4 and check the radio button in the Purpose of Filing box. (The instructions said Box 11 but my form had it listed as 12.)

After submitting your form, you may receive messages such as "can't find remittance ID ..." or "A notice that a fee is required for each submission ..." or even a message stating "A fee may be required ..." and that you should "... please continue to the fee Form 159..." I received all of these when I recently filed. These notices can be ignored if you're just renewing your license. The various fee requirements can be reviewed at [http://www.fcc.gov/fees/98wtbguide.txt]. As stated on this FCC page, "The regulatory fees do not currently apply to Amateur Radio Services (except vanity callsigns) ..." I've reported the problem, and hopefully these messages will only

Continued on page 38

Read All About It!

Part 1 of Techno-Trivia from The Hertzian Herald.

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Anyone who has ever QSO'd G-land knows that our British cousins call a vacuum tube a valve, but did you know that they call a filter capacitor a reservoir capacitor? And they don't put up an antenna, they put up an aerial — the masts for which are held in place not by guy wires, but by stays. Also, they don't ground the antenna: They "earth" it.

A Brit doesn't plug in his rig to the AC line with a line cord. He connects it to the mains with a mains flex. If he needs lots of outlets, he doesn't use a cube tap or an outlet strip — he uses a trailing socket. And, of course, the mains are 50 Hz, 220 V. The standard *on* position for a switch in England is *down*, not *up* as in the USA.

On the bench, Tommy (the equivalent of our "Joe") uses not a protoboard, but a matrix board. And our "jumper wires" are his "wander plugs" or "flying leads." He spells "solder" the same, but pronounces it SOUL-der, not SAH-der.

Reprinted with permission from *The Hertzian Herald*, newsletter of the Monroe County (MI) Radio Communications Association (MCRCA).

The Aussies have a few tech terms of their own. My favorite is "Jack and Jill" for our "Jack and Plug." Others, which you should be able to recognize from the above discussion, are: bucket, spout, hill hoist, deck, and fencing wire.

The lowly resistor

We all know how to read the resistor color code — but do you know what it means when the first color band is double width? That indicates that the resistor is not carbon, it's wirewound.

When is a resistor not a resistor? When it's a capacitor.

Sometimes wire windings can produce enough inductance to cause real trouble at high frequencies. I recently measured a 5 ohm, 37 W wirewound that had 14 μH of inductance. At frequencies above 57 kHz, that "resistor" has more inductive reactance than resistance.

Some manufacturers reverse the winding direction halfway through to cancel the inductance. A 10 ohm, 20 W square wirewound I checked had less than 0.3 μH. Still, you should never use a wirewound resistor as a dummy load. Even 0.3 μH has over 50 ohms at 28 MHz.

Have you noticed that 1/2 W and 1/4 W resistors have changed shape in the last decade or so? They used to be perfect cylinders, but now they're dog-bone-shaped, with little bulges at the ends. The cylinders are carbon composition types. They have a central core of carbon mixed with clay. Best tolerance with these rascals was about 5%. The dog bones are carbon-film types. They have a thin film of carbon deposited on the surface of a ceramic cylinder, and easily hold a tolerance of 2%. You may see some of them with a red fourth band, indicating a 2% tolerance.

Getting back to color codes, the companies had a fit about 15 years ago, putting out resistors with a fifth color band, almost always yellow. This was just hype, crowing that the resistors pass a military-specified test with fewer than 0.001% failures per 1000 hours. And speaking of military, you may see resistors with values stamped on them — for example, 24R9. The R is the universal decimal point in resistance, so it's a 24.9 ohm resistor.

When is a resistor not a resistor? When it's a capacitor. Half-watt carbon-film resistors have typically 0.3 pF of stray capacitance between their leads. Half-watt carbon comps may have 1 pF, and 2 W comps may have 3 pF. Try to use a 91k-ohm and a 10k-ohm carbon comp to make a 10-to-1 voltage divider at 14 MHz, and you'll get a division closer to 2-to-1, from the 11k-ohm stray capacitance across each resistor. Try to make a 20 W, 75 ohm dummy load from ten 750 ohm, 2 W carbon comps in parallel, and you'll get a 30 pF of capacitance shunting the resistance. That's 37 ohms of reactance at 2 meters, and a 3-to-1 SWR!

Dit dit dah dah dit dit

Forgive me if I indulge in two of my favorite topics: CW and the history of radio. Did you know that Samuel "F.B." Morse did not invent the Morse code? He came up with the idea for a magnetic telegraph in 1832, and had a working version by 1837. For a code, he envisioned sending only numbers. The first five digits would be represented by one to five brief ON switchings of the current. He called the ON signals dots. For the digits 6 through 0, he proposed to use again a series of up to five dots, only these would have a much wider spacing between them, since operators might lose count if ten dots were required.

Every word in the language was then to be assigned a number, which would be sent to represent the word. Morse was nearing completion of his word-to-number and number-to-word dictionaries in 1844 when his assistant, Alfred Vail, came up with a new idea for a code using dots and dashes to represent letters. In fact, it used three ON lengths (dots, dashes, and long dashes) and four spacings (short or long spacing between elements of a letter, a longer space between letters, and a still longer space between words). This became the American Morse code. You can still hear some old-timers using it on 80 and 40 meters.

Most Old American Morse letters are the same as the new International Morse letters we are familiar with. Here are some that are different:

C didit-dit
F didahdit
L daahhh
O dit-dit
P dididididit
Y didit-didit
3 (numeral) dididídahdit
question dahdididahdit

Note that didit (short space) is I; dit-dit (long space) is O; and dit dit (longer space) is two letters (EE) in succession. The rhythm of the Old Morse C is familiar to us in the last three dots we send for DE, meaning FROM. A very long dash is letter L, which is also used for numeral 0. (If you thought it was a clever timesaver to send a single long dash for a zero, Vail thought of it a century and a half ago.)

American Morse was the standard in the days of spark, and wasn't effectively replaced by International Morse until tubes took over about 1920. The surviving wireless operator of the *Titanic* (1912) complained bitterly about rescue operators who knew only American Morse.

If we could go faster than light, would time run backwards?

Our SK, meaning End of Work, comes from American Morse. The numerals 30, long used by newspaper copy editors to mark the end of an article, come out dididídahdit daahhh in Old Morse. We simply closed it up to dididídahdidah. Our ES for AND is not borrowed from another language, as many assume. Old Morse has a separate symbol for the ampersand (&), which is dit-dididit. (By the way, the name ampersand comes from a slurring of British schoolchildren reciting the alphabet and tacking on at the end, "and per se, and." Per se is Latin for "by itself.")

Frustrated telegraph ops often sent DAMN, which they shortened to DN. To avoid trouble in a Victorian era, this was copied on the message pad as a question mark or a slash. In American Morse, dahdididahdit is now the

official question mark, while for us it is the slash.

Like the word HAM itself, the word LID, meaning a poor operator, has several contending explanations. One is that new Morse ops would attach a tobacco can lid to their sounder to get a ring that could be distinguished from the clacking of other sounders in a crowded telegraph office. Another is that it is simply a contraction of LIfteD, a slang term applied to an operator who had been taken out of a main office and sent to a backwater station where he could cause less trouble.

For a closer, how about some CW information you can use? If you've wondered how fast you're sending and want a quick way to check it out, send THE QUICK BROWN FOX JUMPS OVER THE LAZY DOG (no period). There are 35 letters, equivalent to 7 five-letter words. If you send it in 60 seconds, that's 7 wpm — good enough to pass the Novice test with room to spare. If you send it (and receive it) in 30 seconds, that's 14 wpm, and you're ready for the General. Do it in 20 seconds, and you're at 21 wpm — time to upgrade to Extra!

Which way did it go?

The surest way to start a fight among electronics types is to ask which way current flows. It all started when Ben Franklin was corresponding with experimenters in Europe about electric phenomena. Everyone realized that there were positive and negative "electric fluids," which they called vitreous and resinous. They knew that these "fluids" flowed from one to the other — although no one could say which way. Franklin proposed the "convention" that they would speak of the fluids as flowing from positive to negative, and everyone agreed.

The telegraph was invented; Maxwell developed the electromagnetic theory; telephones, light bulbs, and electric railways came into use — all explained by the ideas of electric fluid and Franklin's convention. Then, in 1898, Thompson (not Lord Kelvin; another Thompson) discovered the electron, and it soon became clear that the "fluid" consisted of negative particles, and that (in a copper wire, at least) they flowed the opposite way from Franklin's convention. Before 1920, it was clear to everyone that explanations of the vacuum tube made no sense at all using conventional flow, and many books began teaching that current consisted of electrons going from negative to positive.

Still, the electrical engineering community stuck with the conventional (positive-to-negative) flow that had served them so well in the past. Patience paid off, because when the transistor appeared on the scene it had to be explained partly in terms of "hole" flow from positive to negative ... just like conventional current. (To visualize hole flow, think of a bubble floating up in a glass of beer. Gravity pulls the beer down, which makes the bubble go up.)

Today, we have such powerful groups as the US Navy teaching electron flow, and the IEC (International Electrotechnical Commission) teaching conventional flow. Some of the most popular Community College electronics books are actually available in two versions, so they can sell to instructors with either prejudice. So, which way do I teach? I always answer that question with a little story:

Three applicants were waiting or a job interview. One was a business graduate, and when he went in, the boss asked, "How much is 2 + 2?" The business grad said, "You have to consider the increased marginal tax rate when combining assets, so it is likely that ..." The boss interrupted and said, "That's very astute. We'll call you."

The second applicant was a math major, and on being asked the same question, he relied, "If you mean 2.000 plus 2.000, then the true sum lies between 1.999 and 2.001, but if you mean ..." But the boss cut him off and said, "Very intelligent. We'll call you."

The third applicant was a technician, and when he went in the boss asked, "How much is 2 + 2?" The technician replied, "How much do YOU want it to be, Boss?" Of course, he got the job.

Now, which way does current flow? Better learn both ways, and then be ready to do it the boss's way!

"That's unreal!"

In the last section, I noted that the world of electronics is divided into two armed camps — electron flow adherents versus conventional flow (positive-to-negative) partisans — and I attempted to steer a neutral course between the two. Such fence-sitting seems to anger some folks, who feel that electron flow is "the truth" and that common sense should move all but the perversely stubborn to discard conventional flow as a manifest error.

Ah, if only subatomic phenomena were simple matters of black and white. As a common-sense example, do you see the letters on the page in front of you? It is conventional and convenient to say that we see them but, of course, the letters are black and reflect no light. We see the white paper, and *don't* see the black areas that comprise the letters. Shall we condemn all those who refuse to acknowledge their error and continue to speak of seeing the letters "black on white"?

Another example of mistakenly applying common sense to subatomic phenomena is the assertion that AC doesn't "really" flow through a capacitor, because the insulating dielectric prevents the electrons on one plate from passing through to the other plate. A zillion electrons may flow into the negative plate, but it is *different* zillion electrons that flow out of the positive plate. If we could paint the electrons on one side blue, we would see no blue electrons coming out the other side.

The error in this argument is that you *can't* paint an electron blue, or carve your initials on it, or distinguish it in any way. Every electron is exactly identical with every other electron, so arguments based on suppose distinctions are nonsense — and AC "really" does flow through a capacitor.

I often hear a similar argument from beginning physics students when they learn that time slows down at relative velocities approaching the speed of light. They ask, "If we could go faster than light, would time run backwards?" I reply that you can't go faster than light, because mass approaches infinity and acceleration under any force goes to zero. They come back with, "But if you *could* go faster than light ..." Whereupon I am forced to answer, "Well, you can't, so let's stop talking nonsense."

Additional absurdities crop up in discussing what an atom "looks" like — the color, shape, and surface texture of an electron, for example. To look at a single electron, you have to throw a photon of light at it, which will knock it silly. A single electron doesn't "look" like anything, nor does it have a surface texture or a color, both of which imply an arrangement of many atoms together.

We use mathematical models to describe how electrons behave in response to various forces, but human experiences of time, size, and weight have nothing in common with an electron. When we attempt to apply "common sense" to phenomena that are completely outside the realm of the common experiences of our five senses, the result is likely to be nonsense. 73

A Cold Meal and a Hot Radio

That's what this XYL's OM now comes home to.

Joyce Ann Seay AD4EX
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Everyone becomes involved in amateur radio for her own reasons. When I first got involved, it was because my husband, Charles Seay KN4HL, was involved, and I wanted to see what it was all about. He had been a ham as a youngster and had not been active for a long time. After we married, both for the second time, I encouraged him to get back into amateur radio. I never dreamed at the time that I was setting in motion something that would have a profound impact on my life.

Not long after my husband got back into the hobby, he and some other hams in our area started a club. I was surprised that there were some women involved, and decided to go to a meeting to see what was going on. I met some of the nicest people I had ever met. About that time, my husband first suggested that I might want to get my license. I wonder if he realized that he had opened Pandora's Box.

Back in those days, the only entry license was the Novice Class. The theory wasn't bad, but I soon formed a distinct dislike for Morse code. Thanks to the Gordon West's tapes, I finally was able to pass my 5 wpm and become a Novice. I had no ambition to ever upgrade beyond that.

My license had been framed and hanging on the wall of the shack, alongside my husband's, for about a month, and I still hadn't made a contact. He was on 10 meters one night and called me into the shack. He said someone wanted to talk to me. I reluctantly took the mike and had a brief QSO with a ham in Minnesota. To my amazement, people from all over the country started calling me. I spent the rest of the evening on the radio. That night I fell in love with 10 meters. I soon had taken over the shack, and my husband had lost his radio. I was perfectly content with my Novice license. At that time, 10 meters was open around the world, and I soon had QSL cards coming in from the four corners. As the saying goes, "My husband used to come home to a hot meal and a cold radio, now he comes home to a cold meal and a hot radio."

I soon had taken over the shack, and my husband had lost his radio.

About that time, our area got a two meter repeater. Now all the hams were hanging out on two meters, so I got my Technician Class license. No code to pass on that one, so I was happy. After I upgraded to Tech, I started thinking about General. I had passed the 5 wpm, so how hard could 13 be? Right! But as they say, "fools rush in," so I did.

Once again, I was spending lots of time with Gordon West. Now my husband came home to a kitchen table littered with code practice sheets and no dinner at all. I literally had code on the brain. Everything I saw I would translate into code. I even started dreaming about it. On my second try, I passed the 13 and got my General. I was one happy camper!

Now, of course, I had to get the Advanced. Just theory. Well, the theory was getting pretty deep, but I hung in there with the thought—at least there wasn't any code—and I soon got my Advanced Class license. I had gone from KC4RNX to KQ4FI. I wasn't really happy with my call, and my husband, always one to be helpful, suggested that if I got my Extra I could

Continued on page 38

Secrets of Transmission Lines

Part 5: Impedance and reflections, including a "kitchen table" experiment.

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In the last part, we dealt with transients flying up and down the transmission line and saw the fact that a solid termination (being tied firmly to a tree) would cause a reflected wave to appear. In this chapter, we will be examining the effects of the line with a steady-state AC excitation.

Going back to the telegrapher's equation, let us make a substitution to simplify writing some of the relationships. To begin with, let:

$A_f = [t - (x/v)]$
eqn (5-1)

and

$A_r = [t + (x/v)]$
(5-2)

This is simply a shorthand to simplify the printing of the equations. Note that we will change A_h (backward) to A_r (reverse). As noted previously, equation (5-1) implies that the farther to the right we choose x, the younger or earlier will be the forward wave at that point. Conversely, equation (5-2) tells us that the farther to the right we choose x, the older the reflected wave will be at that point. Restating in another fashion, A_f travels left to right and A_r travels right to left.

Now, harking back to part 2 and Euler's equation, we recall that we can describe a sine wave with the term

$\exp(j*w*t) = \sin(w*t) + [j*\cos(w*t)]$
(5-3)

where:
exp( ) is the log base epsilon

We had noted earlier that E_f and E_r could be functions of time. If we choose to make them sinewaves, we can write equations (4-3) and (4-4) as:

$E = E_f*\exp(j*w*A_f) + E_r*\exp(j*w*A_r)$
(5-4)

and

$i = (E_f/Z_0)*\exp(j*w*A_f) - (E_r/Z_0)*\exp(j*w*A_r)$
(5-5)

This describes the forward and backward waves at any instant in time and at any location on the line.

Reflections on the line

It seems fair at this point to ask where the reverse wave comes from. The answer is most generally from reflections. It is possible to excite a line at both ends; however, it is seldom advantageous to do so. On the other hand, any departure from the uniform characteristics of the transmission line will generate a reflection or a backward wave of some amplitude and phase.

To begin with, let us consider the extreme case in which the far end of the line is short circuited and the resistance of the short is zero. It should be obvious that no amount of current flowing in the short will generate a voltage at the short. Therefore, the reflected voltage must completely cancel the forward voltage and must be 180 degrees out of phase with it, or $E_r = -E_f$. The current in the short will be twice the forward current.

For the converse case in which the line is open circuited, the current must be zero, since no amount of voltage can make a current flow in the open circuit. To drive the current to zero at this point, we must have the forward and reverse current waves equal and in

phase; therefore, $E_r = E_f$. The voltage at this point will be twice the forward voltage.

In the third case, where the termination is a resistor equal to the characteristic impedance of the line, there is no reflected wave and $E_r = 0$. As noted previously, no electrical measurement on the line itself from the sending end can distinguish a perfectly matched line from an infinitely long line. I suppose that someone will point out that if the perfect termination on the far end of the line was an antenna, then we could receive the signal and, using some modulation scheme, determine the total time of flight. Picky! Picky!

The quantity E_r/E_f is termed the voltage reflection coefficient. As we have seen, it can vary between a -1 and a +1 and can also be zero. The voltage reflection coefficient is usually represented by the Greek letter Gamma Major. Consider the illustration in **Fig. 1.** It shows two vectors representing E_f and E_r rotating in opposite directions as a function of A_f and A_r. Since we are interested in the steady-state condition, we may drop the (j*w) term and concern ourselves with the long-term average.

With a little thought about it, we can see that these vectors rotating in opposite directions at the same speed will fall atop one another twice per revolution and will oppose one another twice per revolution. In other words, twice per wavelength on the line you will find a voltage peak where E_f and E_r add, and twice per wavelength you will find a place where they cancel and there is a voltage minimum on the line. The ratio between these amplitudes is commonly referred to as the VSWR or Voltage Standing Wave Ratio:

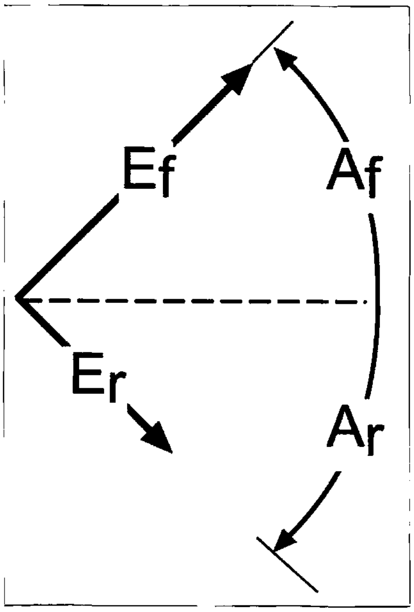

Fig. 1. Rotation of $E_f + E_r$ with $A_f + A_r$.

VSWR = $(E_f + E_r)/(E_f - E_r)$
(5-6)

VSWR = (1 + gamma)/(1 - gamma)
(5-7)

Note that with a little algebraic manipulation we can re-arrange equation (5-6) to:

E_r/E_f = (VSWR - 1)/(VSWR + 1)
(5-8)

Since both E_r and E_f are across the characteristic impedance of the line, the power in the forward and reflected waves is proportional to the square of the voltages. Therefore:

$Pwr_r/Pwr_f = (VSWR - 1)^2/(VSWR + 1)^2$
(5-9)

Most solid state ham transmitters will start shutting down power at a VSWR of two or so. This corresponds to:

$E_r/E_f = (2 - 1)/(2 + 1) = 1/3$

Thus the power in the reflected and forward waves is:

$Pwr_r/Pwr_f = (1/3)*(1/3) = 1/9$

The backward wave has a third of the voltage and a ninth of the power. It is noteworthy that many of the very broadband military and commercial antennas — covering perhaps 2 to 30 MHz or 225–400 MHz — have VSWRs that seldom get any better than 2:1 or 2.5:1 The characteristics of log periodics and discones and traveling wave helicals include a VSWR that simply does not get below these levels. In order to obtain the continuous coverage (any frequency within the range), the military equipment simply puts up with the VSWR.

Line impedance

Impedance is defined as the ratio of voltage to current, and we saw with our short circuit example that at the short circuit and every half wave down the line toward the source, or sending, end, the voltage is zero and the current is maximum. This corresponds to an impedance of zero.

Conversely, at the open circuit the voltage is maximum and the current is zero, and this repeats itself every half wave toward the source. The current zero and voltage maximum correspond to an infinite impedance.

In this case, with an infinite VSWR, the impedance of the line is cycling between zero and infinite impedance along its length every quarter wave. Measuring with only a single frequency, it is not possible to tell the difference between a short circuit an even number of quarter wavelengths down the line or an open circuit an odd number of quarter wavelengths down.

When the VSWR is more reasonable, it is perhaps not quite so obvious, but at every voltage maximum the current will be minimum, and the impedance will be maximum and furthermore will be a pure resistance equal to VSWR*Z_0. At every voltage minimum, the current will be maximum and the impedance will be minimum and a pure resistance equal to Z_0/VSWR. At all other points on a mismatched line (meaning VSWR > 1), the impedance will have a reactive component as well as a resistive component.

As an example of this, on a 50 ohm line (Z_0 = 50 ohms), if we measure the forward power as being nine times as great as the reflected power we know that the VSWR is 2:1 from equation (5-8). This would tell us that at the voltage peaks the impedance is 2*50 = 100 ohms, and at the voltage minima the impedance is 50/2 = 25 ohms.

Fun with standing waves

Having been through this discussion, let's have some fun with standing waves. To do this, you will need

a 2 meter transmitter of some sort, some lengths of RG-58 cable or equivalent, a length of TV twinlead cable, and a diode voltmeter. We will be measuring the standing waves on the TV twinlead because it is easy to see them there. On coax, the standing waves are on the inside and not accessible except with a slotted line.

The first thing to do is to build a balun to transform the unbalanced coax into a balanced structure for the TV twinlead. Do not neglect this step, because if you directly connect the coax to the twinlead you will have RF all over everything and will measure nothing.

The balun shown in **Fig. 2** consists of a half wavelength of coax bent into a "U" and attached to a coax line of essentially any length with a fitting to connect to the transmitter. At 146 MHz with RG-58 cable having polyethylene insulation, a half wave is approximately 26 inches. If you have Teflon-insulated cable, the length is approximately 28 inches. Add about an inch for connections. You will find this job easier to do if you have cable with honest braid and not aluminum foil. Strip the jacket back a half inch on both ends of the "U" and the end of the feed cable.

Connect the outer conductor of one end of the "U" and the outer conductor of the feed cable together with a wire binding as shown in the figure. At the same point, connect the inner conductors together, being careful to avoid shorting them to the outer conductor. The TV twinlead will attach with one conductor attaching to "A" and the other attaching to "B".

If you happen to have a UHF directional coupler, the assembly should show a low VSWR measuring on the feed cable with a 200 ohm carbon resistor between points "A" and "B". The resistor must be carbon or film and definitely not wirewound. If your transmitter power is more than a watt or so, it may be necessary to parallel several resistors as described in part 1 to obtain the 200 ohms with an appropriate power rating.

Next, cut a length of TV twinlead about 10 feet long and strip about a quarter inch of wire on both ends. If you have a plank that length, you could tape the twinlead down every six inches or so. If you don't have a plank, you can stretch it out on a table. Don't let the twinlead lay on or cross a conducting surface.

The resistive net is intended to prevent your transmitter from looking into impedances that might damage it. For most handhelds on low power, a one watt size will suffice for the 200 ohm resistor, and half watt sizes will do for the 51 ohms.

The final item is the detector. We would like to have a detector that will be sensitive to the voltage difference between the conductors, and insensitive to the voltage to ground that the conductors have in common. The common mode voltage or common voltage to ground will arise only because of an imperfect action of the balun. It does not participate in the transmission line action and serves only to confuse the measurement.

The detector circuit shown in **Fig. 4** is intended to suppress common mode voltages and to respond to line-to-line voltages. The square object represents a piece of printed circuit board about

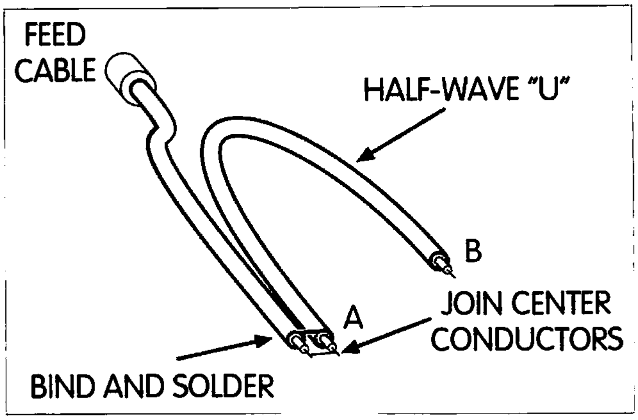

Fig. 2. Half-wave balun.

1/2 by one inch. With a sharp knife, cut a slit down the center and check with an ohmmeter to make sure that the two halves are electrically isolated. The four diodes represent a bridge rectifier.

You cannot use a made up power bridge or power rectifiers like 1N400x at two meter frequencies. The bridge works best with UHF germanium diodes; however, it will function with high speed switching diodes like 1N914 or 1N4146. A zero-to-1-mA meter movement will function satisfactorily for the detector, and the resistors should be selected to give about a half scale reading on a matched line.

The foam guide on the probe is intended to hold the probe in a constant relationship to the line as we slide the probe along the line. You probably will have better results if you firmly mount the components on a circuit board and provide a wooden handle to keep your hand six or more inches away from the line as you slide the detector along.

Now the experiments

TV twinlead is nominally 300 ohms in Z_0; therefore, let us start by terminating the far end (away from the balun) with a 300 ohm carbon or film resistor. Keep the leads as short as possible. With the transmitter running somewhere around 146 MHz, you should have a reasonably flat response from the detector. The meter reading should be more or less constant no matter where on the line you slide the detector. Because of the relative crudeness of the construction, do not be too surprised if you find a variation of 4% or 5% in the readings.

Remove the resistor and leave the line open-circuited. This time you should find a very pronounced standing wave on the line. The voltage will be high at the open end and will fall sharply to near zero a quarter wave toward the sending end and a half wave beyond that. Take some masking tape and mark the places where the voltage minima were, and identify that these are for the open circuit.

Next, solder a short circuit across the end of the line. Don't just twist the wires — solder a jumper in place. This time the voltage at the short will be near zero and the next minimum will be a half wave toward the sending end. Mark and identify these as before. The distance between minima should be the same for the short circuit case as it was for the open circuit case, and the minimum for the shorted case should lie very close to being centered between the minima for the open circuit case. We will explain the "very close" as opposed to "exactly" shortly.

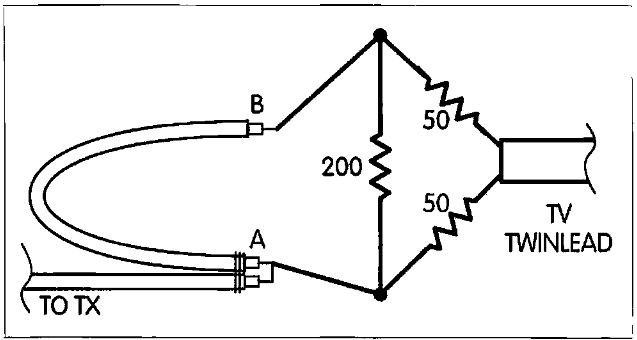

Fig. 3. The circuit.

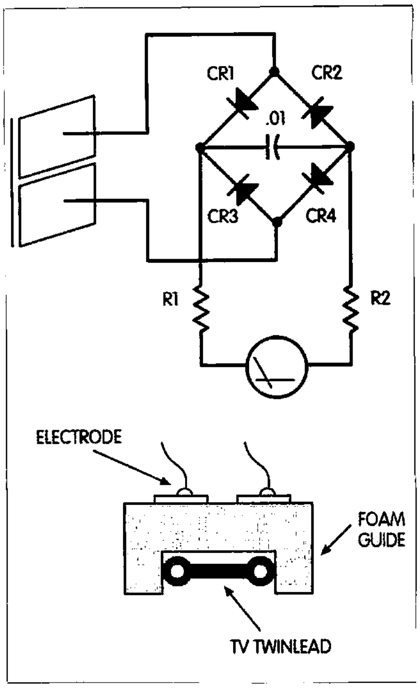

Fig. 4. The detector.

Next, let us replace the short with a 100 ohm carbon or film resistor. In this case, the VSWR will not be nearly so high and, as a matter of fact, should measure 3:1; that is, the peak voltage should be three times as great as the minimum and the minima should lie almost exactly on the marks for the short circuit.

Finally, replace the resistor with a 600 ohm resistor. In this case, the VSWR should measure 2:1 and the minima should lie close to those for the open circuit case.

Conclusions

These experiments were intended to prove that:

(1) The point of minimum voltage on the line is always resistive.

(2) The impedance on the line at the voltage minimum is Z_0/VSWR.

(3) A line terminated in its Z_0 has no standing waves.

If instead of measuring voltage we had measured current, we could also have shown that the points of minimum current are resistive and equal to Z_0 *VSWR. Our measurements paid little attention to finding the voltage peaks

Continued on page 38

Need a UHF Dipper?

Part 3: Mods for using the tuner as a dipper.

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Parts 1 and 2 of this series provided discussions regarding the theory of a TV tuner's resonator, frequency measurement techniques, and how to couple the oscillator to an outside environment. This is the final part in the series, which will discuss the modifications that may be used to utilize the tuner as a dipper, and to shift the operating frequency into an adjacent ham band.

Modifications

As pointed out earlier, modifications to the oscillator circuit should be performed only as required for getting the oscillator to operate within a desired frequency band. I've assumed that most applications involving the dipper are for the 450 MHz band, so the emphasis has been placed on attempting to lower the operating band.

But for those who are interested in moving the dipper up into the 902 MHz region, the modification primarily requires reducing the capacitive top loading marked as "padding" as shown in Part 1, Fig. 2. Reducing the capacitive bottom loading will also assist in raising the operating frequency, but at a lower percentage of effect than that controlled by the top loading. It might be necessary, as a last resort, to remove capacitor plates in order to reduce the top loading sufficiently to gain the desired upper frequency. The capacitor plate removal must be done gingerly, to protect the ceramic insulators. In addition, applying the oscillator's supply voltage directly to the varactor's control terminal may decrease some bottom loading.

Each modification to be discussed will be progressive, starting with the simplest and progressing to the one requiring surgery. Again, surgery should be avoided if at all possible in order to preserve the dipper's integrity and operation, even if the dipper remains a little high in frequency.

(1) The first modification is to solder a phono connector to the oscillator wall (refer to Part 2, Fig. 2). The sense loop connection scheme will have to be worked out at this step. However, one of the schemes may be used temporarily while lowering the oscillator's frequency, as indicated in the step below. Once the operating frequency has been established, then the experimentation must begin to find the best sense loop scheme.

(2) Increasing the top loading on the resonator can be accomplished by tacking a padding capacitor between the variable tuning capacitor and the top of the oscillator wall as shown in **Fig. 1.** A suitable capacitor, as shown in **Fig. 2**, has a value range from about 0.5–15 pF. Piston and small adjustable ceramic capacitors are best suited for this application, but disc ceramic and tubular ceramic fixed value capacitors may also be used.

With the capacitor adjusted for minimum capacitance and tacked into place, apply supply voltage to the oscillator and monitor the activity as observed on the meter. Adjust the tuning capacitor to the lowest frequency, then

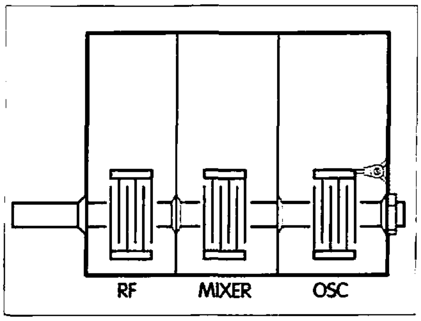

Fig. 1. Increase in top loading using a small variable capacitor.

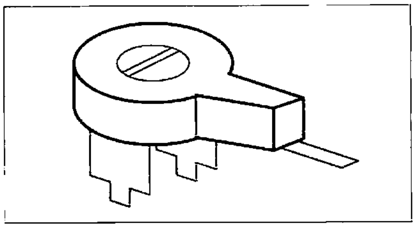

Fig. 2. Typical trimmer capacitor used for top loading. A suitable capacitance value is about 0.5–15 pF.

raise the frequency while observing the meter. If the meter indication is low or zero at the lowest frequency, and then suddenly pops upward as the frequency is increased, then it's possible that there is insufficient oscillator feedback.

Not all tuners fail when the capacitive top loading is increased and the lowest operating frequency attained could easily be in the 430–440 MHz region. Assuming this to be the case, then measure the upper frequency to see that it is above 450 MHz. By adding top loading capacitance, the total tuning range of the oscillator will be narrowed because the percentage of total capacitance that remains variable is reduced. As an example of what happens, the original tuning range was perhaps 470–900 MHz. Lowering the bottom to, say, 440 MHz, the upper frequency may have dropped to perhaps 460 MHz. If the resulting tuning range is acceptable, then adjust the padding capacitor slightly to center the tuning range within the desired operating band.

I've found that once the final padding capacitance has been determined, replacing the variable with a fixed value capacitor of the same value works very well. Typically, the capacitance value will fall within the range of 1–5 pF. Disk ceramic and tubular ceramic capacitors are a good choice.

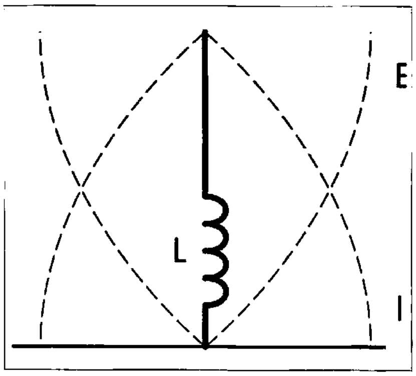

Fig. 3. Adding inductance (L) near the bottom of the resonator effectively lowers the resonant frequency.

(3) Some tuners have a loop of wire (or stamped metal) mounted near the oscillator's resonator. The loop is grounded on both ends, and as such becomes an inductor that is placed in the I field of the resonator for inductive loading control. Moving the loop closer to the resonator will raise the operating frequency, and moving it away will lower the frequency. When modifying the tuner-dipper for the 450 MHz band, the loop should be pushed flat against the metal wall. If the modification is being considered for the 902 MHz band, then the loop may be made closer, if necessary, to the resonator to increase the operating frequency band.

(4) The fourth level of modification involves increasing the oscillator's feedback. A common-base Colpitts oscillator, as used in a UHF TV tuner, is dependent upon the capacitive coupling between emitter and collector terminals. I've been successful in increasing the feedback with some tuners, while others appear to have sufficient feedback already and there is no additional reaction to the increased feedback attempt.

If it's necessary to increase the feedback, locate the transistor's emitter lead that has a resistor connected between the emitter lead and ground. Solder a piece of small wire (bare or insulated) onto the emitter lead and allow it to extend upward. The length of the added wire should be between 1/4 and 1/2 inch. With power applied, use a thin wooden stick or plastic rod to move the tip of the wire toward the collector terminal without actually touching the collector. Observe the meter and the indicated oscillator level as the wire is moved. If the level increases, then proceed some more. Moving the wire from side to side while advancing toward the collector helps locate the point of greatest feedback. Rotate the tuning capacitor and observe the amplitude reaction. In some cases there will be an amplitude increase across the tuning range, while in others, the amplitude variation swing will be greater. Choose the best compromise for the desired band segment.

Should there be no additional reaction or no reaction at all, or an adverse reaction occurs, then cease working with the feedback. Remove the wire lead if necessary to restore the "stock" feedback.

(5) The fifth level of modification is to work with the capacitive bottom loading. Some tuners have built-in piston trimmer capacitors so that bottom loading can be used to "trim" or position the frequency band. Increasing the capacitance value of the trimmer capacitor results in lowering the oscillator's frequency. Because the oscillator transistor and the trimmer are essentially in parallel, increasing the capacitance value too much will "kill" the oscillator's feedback. It may be desirable to attempt increasing the feedback as indicated in step 4 above.

When a trimmer capacitor is not provided on the tuner, one may be added, if desired, by tacking a trimmer between the transistor end of the resonator and the edge at the nearest wall. A suitable trimmer capacitance value is in the range of 0.5–5 pF, which is sufficient to evaluate the effectiveness of bottom loading. Care must be taken when working on the transistor end of the resonator because of the very limited space that is available.

As an example, when moving the oscillator up into the 902 MHz band, should it be desired, a small measure of reduction in bottom loading capacitance may be accomplished by applying a voltage to the varactor control terminal. Jumpering the control terminal directly to the +VCC lead will accomplish the task.

(6) The last modification, one requiring surgery, should be avoided unless it is the last resort.

BEWARE! Performing surgery on the tuner may render it useless.

To gain a perspective of what's required, let's return for a moment to the theory of the resonator. We attempted to lower the frequency of the resonator by adding capacitive top loading, and that failure required a more extensive modification. The next attempt lies

with increasing the inductance value of the antenna element. **Fig. 3** depicts the desired E and I fields that will support the objective.

Again, in looking at the resonator as a quarter-wave antenna, the electrical length can be increased (lowering of the resonant frequency) by inductively loading the element. Inductance has the greatest effect on the antenna element when it is operating in the I field. The magnitude of the I field is the greatest at the ground end of the resonator, indicating that the added L should be placed as low as possible on the element. By adding a lumped inductor into a normally distributed L and C environment, the desired results will be obtained even though a step or discontinuity appears in the field pattern.

How can the inductance be increased in the tuner's oscillator when the resonator is a wire or strip of sheet metal? The only way is to cut the resonator at a point closest to the RF ground end. If that can't be done near the ground end, then moving to a location below the midpoint of the resonator will have to do. The result of adding lumped inductance becomes less effective as the L is moved up from the ground end.

To perform the cutting operation, I've used a hobbyist's tool spinning a dental burr. A narrow cut was made in the resonator using the burr, and then a lumped inductor was soldered between the severed ends of the resonator. As a caution, diagonal cutters should be avoided as they can cause severe trauma to the ceramic insulators.

The amount of inductance to add can only be determined experientially. My suggestion is to use a piece of #22–26 buss wire (or a resistor's wire lead) and form a 1/8-inch wide "U," and then solder the ends of the "U" across the resonator's gap. The length of the "U" might be 1/4 of an inch for starters. Measurement of the lowest frequency will be required for each change in the L value. If more inductance is required, then either increase the length of the "U" or try two turns of buss wire formed by winding the wire around an 1/8-inch-diameter mandrel.

Too much added lumped inductance can also "kill" the oscillator, as did excessive capacitive top loading. Increasing the oscillator's feedback may be helpful.

Final comments

The old mechanical variable UHF TV tuners can be used as UHF dippers. Perhaps two or more modified tuners would be required to provide coverage for the potential frequency range of 440–910+ MHz.

With minor modifications, "stock" mechanical tuners can be used as a dipper in the frequency band covering approximately 470–900 MHz. Then, with specific modifications, some tuners may be moved either lower or higher in frequency than that available from the "stock" tuner.

Although packaging had not been discussed regarding the tuner-dipper, the user has complete freedom in completing that aspect of the project. To facilitate the use of the device as a dipper and for convenience, the sense loop may be located over the oscillator wall on the tuner's end opposite the tuning shaft.

Because tuners from different manufacturers vary in design, be ready to experiment and have fun with the tuner-dipper project. The results of the project offer the ham experimenter a very useful tool, and a world of new experiences.

Secret Death Ray

continued from page 17

scientists, is that I found nothing sinister, or even out of the ordinary for that matter. In the end, the site may be more about government research than about some kind of mind control device or apocalyptic doomsday machine. The Web site sponsored by the Navy has good solid information on ionosphere physics, real-time data valuable to hams, and a chance to see how good the current weather is in the interior of Alaska.

You may contact me at [AFDEK1@uaa.alaska.edu] if you have questions or comments. Please be aware that I do not own a tin foil hat.

More information can be found at [http://home.navisoft.com/wes/aliens/haarp.htm] on the patent that caused the fuss. At [http://www.sightings.com/political/weapons/haarp.htm], there's a fringe article on the system as a doomsday box. [http://www.haarp.alaska.edu/haarp/rindex.html] has University of Alaska information on the science performed at the site.

The *Anchorage Daily News* (a local newspaper) has published a large number of articles about HAARP. Use [http://www.adnsearch.com/index.cfm] to search their database for information on HAARP, books about the system, and local letters to the editor.

TV Tutor

continued from page 23

from the transceiver. Serial port interfacing appears to be quite forgiving, particularly with new transceivers that have suitable sound levels on their data sockets on the back. But I hear regularly tales of woe by sound card users. There are complaints of "No picture," which means, the sound level going into the card is way too low, or "noisy picture with excellent signals," which means the level is so high your sound card decodes the noise only. Strong patterning may mean that the transmitter was overdriven with a high level of audio.

There is also the problem of the computer getting into the transceiver and vice versa. I understand that the FCC no longer effectively enforces its regulations regarding computer interference. The most strictly enforced regulations are found in Europe, where not only the output of hash is restricted, but also the susceptibility to it. Computers sold here in New Zealand are better than they were, and laptops may be clean, in fact. But although the European regulations were adopted here, they are not enforced. My own computers and monitors are not completely clean, but I can receive DX SSTV.

Older DOS-based programs (and my RISCOS-based one) may need to receive a complete picture before you

can start preparing a picture to be transmitted. The newer Windows-based programs do allow multi-tasking. You see who a picture is from as you receive, and you put a reply text on a picture you choose for your transmission. I am regularly frustrating Italian and Spanish DXers when I choose to wait for the completion of a received picture before composing my reply. SSTV contests are just about impossible without multitasking.

There are several SSTV standards in use, but the ones commonly seen are just two, Scottie and Martin. Their resolution is 320 x 256 picture elements ("pixels"). Both take one or two minutes to transmit. There are modes offering higher resolutions, but their long transmission speeds are only tolerable when you need to get publishable photos from one end of the town to another, on VHF, and on Sunday night.

All SSTV programs have built-in graphic support, for inserting text and pictures and special effects. Some SSTV control screens look like the cockpit on a 747, while others need few controls. There are now so many SSTV programs that I cannot detail them all. Even those that you pay for are so cheap that you can afford to try several.

Please do not circulate paid for programs for free. A popular SSTV program is no longer easily available through ordinary channels, because its full version was put on the Net.

I hope I have not turned you off with all this detail. I suggest you get yourself set up by utilizing the first few paragraphs of this article, and then use the rest as reference once you have an SSTV program on the screen before you.

Why Not Renew On-line?

continued from page 25

be displayed where actually required in the future.

You'll receive a summary submission page after filing. This will have a Submission Identification Number, date of submission, and your callsign on it. Print this out or write down the ID number in case of any problems later, or in case you need to contact the FCC about the filing.

That's all there is to it: A few minutes on-line, and you're covered for another 10 years of exciting hamming. So what kind of turnaround can you expect? Well, after I had filed on-line on June 4th, the effective date on my license came back as June 8th. It was just a short time later (less than 2 weeks) that I received my license in the mail. The license contained a wallet-size copy and a full-size version. Both were printed on one 8-1/2" x 11" sheet ready for cutting and mounting.

I hope this article helps to make an already easy process even easier for you. If you'd like to read more about the new forms available, I think you'll find all these sites helpful:

[http://www.fcc.gov/wtb/amateur/amrenw.html]

[http://www.fcc.gov/formpage.html]

[http://www.arrl.org/fcc/forms.html]

[http://www.fcc.gov/Forms/index.html]

[http://www.fcc.gov/search/wordsearch.html].

A Cold Meal and a Hot Radio

continued from page 30

change my call. That was before the vanity calls were available.

Well, again I was hanging out with Gordon. I was spending more time with him than with my husband. I had just thought I had a dislike for code. In the next few months I formed a distinct hatred for it, but was too stubborn to give up. On my second try, I passed the 20 wpm code test. I don't know who was more surprised, me or my husband.

From the start, one or two of the local hams always wanted to know when I was going to upgrade. Well, they don't ask anymore. I've been tempted to ask the same question, but so far have refrained.

As you can tell, I'm no big fan of the code, but I'm really glad I had to get my licenses the way I did. I had to work really hard, and I think we always value more those things for which we have worked hardest.

As I said at the beginning, I had no idea how amateur radio would change my life. Not only have I had the opportunity to meet people all around the world, but the real blessing has been the friends I have made here in my home town. I have met some of the most wonderful people—whom I would not have met if we had not both had an interest in amateur radio. I count them as my best friends and I can't imagine life without them. I owe that to amateur radio.

Secrets of Transmission Lines

continued from page 34

because this is harder to do, especially with home-brew measurement setups.

In the next section, we will explore what happens between the voltage maxima and minima, and take a look at the origin of and use of the Smith chart.

QRX

continued from page 6

days to cover part of their lodging. They were also given a Hamvention entry ticket making them eligible for all prize drawings as well as a ticket to the grand awards banquet. But in 2000, that will not be the case.

According to information supplied by Forums Chairman Jim Ebner N8JE, the Hamvention 2000 planners have announced that the cash reimbursement will now be made at a rate of one hundred dollars an hour for each hour that a forum runs. But there is a kind of Catch 22. The payment will go only to the forum moderator. No payment will be made to the other participants.

In other words, if there is a session with a dozen speakers that runs two hours, the person listed as moderator or forum leader gets a two hundred dollar payment. He or she then has the option to keep it all or share it with the other participants. DARA says that it will not get involved.

Also gone is the free Hamvention entry ticket and free banquet ticket. Session moderators and their speakers will get badges that will give them entry to the entire Hamvention. If they want to be eligible for the prize drawings, they will have to buy a ticket on their own. Also, if they want to attend the banquet, DARA will sell them a ticket at fifty percent off face value, but the days of free banquet tickets are also now gone.

No reason was given for these changes, but it's believed that the rising cost of putting on a ham radio convention the size of the Hamvention make cutbacks like this inevitable.

Thanks to N8JE and DARA, through Newsline, *Bill Pasternak WA6ITF, editor.*

Number 39 on your Feedback card

The Digital Port

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You readers plus hams on the air contribute quite a lot to this column. You would think that a ham who does all this experimenting with the various software and hardware combinations would get more air time than anyone else. Not necessarily so. I feel fortunate to get a little quality communication with some of you.

The other day, I was working some PSK31 and happened upon Gene K5FQ. I had listened to a previous QSO in which he was offering a report on the other station's signal, and I had no way of comprehending how he could do this. Hence, the over-the-air call and the ensuing education.

I was telling him the latest software configuration I was using and he suggested I should visit his Web site and download the version 10 of Logger. Gene explained, with no bashfulness, that the latest version of Logger was absolutely the cat's meow and I think he implied I would be sorry if I didn't get a copy.

Experience: Laptop useful, but ...

I had used Logger previously and wrote about it in the October column. It seemed to work quite well in the laptop, which seems to surprise the programming community, but, if you are as lucky as I am, you too may come upon a combination with your laptop that allows you to work some of these modes portable.

The horsepower isn't there when compared with the desktop, but I can usually run one program at a time with a fair amount of success. Until recently, the two machines shared similar specs except for a little less RAM in the laptop. This led me to believe they were fairly equal.

Then the desktop finally balked, and it was time for upgrades that amounted to a bigger hard drive and more RAM. Also, there was a virus loose in the system. While the desktop was down suffering delays, I attempted to cause the laptop to perform the same as the desktop and it would slow to a crawl for lack of RAM. These were "normal" applications such as a word processor, browser, and mail program all running together.

It is nice to have the desktop back running and saving much time. Also, there is a new graphics program that will allow better quality for accompanying pictures. What I am saying is possible encouragement to those who would like to use a laptop that seems a little wimpy. The wimpy laptop at this house has run almost all the ham communication software successfully. Yours may do the same.

Back to the Logger download

Logger is freeware. Most of us appreciate freebies. It is written by Bob Furzer K4CY and is a more complete package than I was aware of. Bob has drawn many favorable comments from users. I went to Gene's Web site and, speaking as a first-time visitor, I can say it is a pleasant surprise. He claims 4,000 links to ham-related topics and has some very interesting ham links on the home page in addition to PSK31 stuff. If you are like me, you will find it irresistible to follow some of them.

The site is [www.mysite.com/k5fq/]. I made a common error when I entered the address the first time. I found by capitalizing the call letters, it didn't work. It went somewhere unrelated and I was a bit dismayed about how to rectify the problem until I tried the lower case k5fq. Just wanted you to know.

There is a link to a screenshot of Logger on the Web site. You should take a look at that as well as the one here in the article. They are different because Logger is, as it implies, a logging program. We all need one of those. My paper logbooks are in

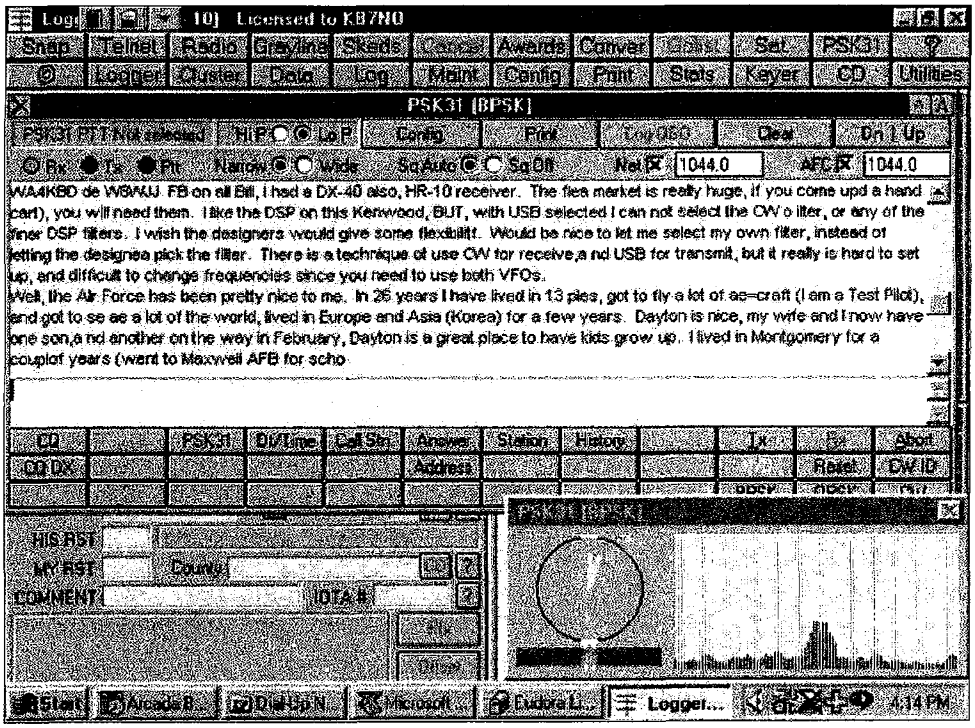

Fig. 1. Screenshot. Here is the Logger program configured to work PSK31. There are portions of four windows displayed. At the very top is a small strip of the basic control screen. Below that is the PSK31 screen with some controls and indicators above the receive screen. Since I was only "reading the mail," there is nothing in the transmit screen. Below the blank tx area are programmable buttons, along with some other standard controls. When you switch to other operating modes such as RTTY or Pactor, there are other sets of programmable buttons. The lower left is the partially hidden entry screen for the logging portion of the program. At the right is the highly effective tuning indicator that includes those elements described in the text and the spectrum analyzer. These windows can be placed where you choose for operating convenience.

disarray and this part of the program is a welcome addition to the shack.

On the Logger site, there are options for first-time users and upgrades. Plus, there are some other helpful files you may need. Plenty of information to get you going.

If you like documentation, you can get all you want. I printed the manual, which turns out to be the help file as well. It comes up in RTF format. I think that imports into most word processors. It displayed 184 pages, and just about all of them are full of information. A few are merely title pages where something will likely be added, but if I had edited those down to size, there would still be a good 160 pages.

The only thing lacking is an index, and if you use the help file in the program, you will have an automatic index with hyperlinks. There are enough bold titles, however, so that you can spot subjects you are searching for. And ... as I thought about it, if this were written by a major software tech writer, it would be expanded to over 500 pages easily. What is written is concise. I did a little extra step before printing. My copy has page numbers now. Hate to drop those bundles of paper when they aren't numbered.

There are instructions on the Web site for installation, just to keep us out of trouble. When I went to do the installation, I realized I had never run the old copy on this computer. I had only done the complete installation on the laptop. I must need more RAM somewhere in this cranium. So ... simple enough ... I had to do that installation first, then begin the procedure of installing the upgrade.

These installations went flawlessly. There are some notes with the software to let you know of the minor abnormalities you will experience during the install, along with the reasons for those hiccups. Keeps you from panicking.

The first thing I wanted to see was the PSK31 mode with its associated windows. The PSK31 is simple enough. You will definitely want to configure the system before you go this far, but that is simple enough. It is slightly more complicated than entering your callsign. If you are new to PSK31, Gene's Web page has links to all the information for radio-to-computer interface.

After configuration, the PSK31 screen will, after clicking the button, display, and you will then need to arrange the windows on the screen for best viewing and accessibility to the various buttons displayed. The screenshot is only one configuration. You will move these windows around several times before you have the "ideal" placement.

In the case of having used the local radio and computer for this mode, it was simple to get the sound levels adjusted. With the IC-735, I have cables running from the accessory port on the rear of the radio to the line-in and line-out on the sound card, and that is all the hookup I use. Then I adjust the sound levels with the audio sound panel in Windows95 to the levels suggested in the documentation.

I have not yet built the necessary interface for PTT. With a little concentration, I turn around quickly enough to satisfy most situations. I may just do that as a next project. Sometimes my concentration ebbs.

The documentation leads you to building an interface to use the mike connector on the radio. That evidently works for everybody, and they don't confuse the issue by telling you that some radios don't need this interface. Perhaps there is info on my hookup somewhere within the hundred or so pages I haven't committed to memory as yet. In any case, sound level is critical, both on transmit and receive.

You will get the most comments if you are overdriving the sound card. The little horizontal field just below the round tuning indicator in the screenshot is called the "waterfall." When the incoming signal is tuned properly, it should display a fairly narrow white waterfall (for want of a better description). If it is wider than what you will soon recognize as normal, the transmitted signal from the other station is not adjusted properly. This leads to interference with other signals.

Just today, I was observing signals on the air and noticed two clean signals with approximately the same amplitude within 40 Hz of each other, and they could each be tuned in and copied very well. Try that in other modes. CW is the only other mode I have seen that would compare.

Now, here is the trick part of the program I wanted to see. I mentioned I had listened to

Current Web Addresses	
Source for:	**Web address (URL)**
HF serial modem plans + software	http://www.accessone.com/~tmayhan/
SV2AGW free Win95 programs	http://www.forthnet.gr/sv2agw/
BayCom — German site	http://www.baycom.de/
Pasokon SSTV programs & hardware	http://www.ultranet.com/~sstv/lite.html
PSK31 — Free — orig. PSK31 — also Logger	http://aintel.bi.ehu.es/psk31.html
Site with links to PSK31 and Logger 10	www.mysite.com/k5fq
PSKGNR — New — Front end for PSK31	www.al-williams.com/wd5gnr/pskgnr.htm
Baycom 1.5 and Manual.zip in English	http://www.cs.wvu.edu/~acm/gopher/Software /baycom/
Source for BayPac BP-2M	http://www.tigertronics.com/
TNC to radio wiring help	http://freeweb.pdq.net/medcalf/ztx/
ChromaPIX & ChromaSound DSP software	http://www.siliconpixels.com/
Timewave DSP & AEA products	http://www.timewave.com
International Visual Communication Association — a non-profit organization dedicated to SSTV	http://www.mindspring.com/~sstv/
XPWare — TNC software with sample download	http://www.goodnet.com/~gjohnson/
Auto tuner and other kits	http://www.ldgelectronics.com
TAPR — lots of info	www.tapr.org
Creative Services Software	www.cssincorp.com

***Table 1.** The infamous chart. "Almost everything ..."*

Gene giving these unusual sounding reports on intermodulation and supplying numbers as well. You too can experience indicators. If you look in the screenshot at the rectangle to the right of the round tuning indicator and waterfall, you will see a spectrum analyzer.

This little screen is marked horizontally with 50 Hz increments, so it is 250 Hz wide. When you tune a signal to the middle of this rectangle, there are two red vertical lines that turn yellow. When yellow, the signal can be decoded and received text displays on the screen. If the transmitting station is not sending text (and only then — much like a RTTY diddle), there is a display of numbers indicating intermodulation. There is an explanation of what this indicates in the manual. It is enlightening.

The most useful part of the tuning indicator, at least at first, is within this rectangle, as it enables simple, quick, and accurate tuning of the incoming signal. After some practice, you will find you could tune without the spectrum analyzer, but as long as it is available, you will always use it. You will get used to where the signal is and how much to turn your tuning knob (slowly) to get there. These are narrow signals at 31 Hz, and you can go by them before you know they are there.

One other thing I learned

I was watching a QSO in which one of the signals was definitely overdriven. The operator was attempting the usual audio adjustments with no success. Then came the revelation that his compressor was on. There are warnings not to have the compressor on, but that was a good example of the reason why, and now, to me, it is recognizable. The waterfall seemed to resemble a cowcatcher on an old steam engine. Another signal might look different, but this one pattern was unique.

Accessing the log file

There is more to the program. I have only touched on a little bit. An important part of the logging program may fly right by during the initial setup. That is that the program creates a log file for you the first time you run it. That log file is titled with your callsign. On the opening screen, if you want the log available to make entries, you must click on your callsign in the little window that presents itself. You will find in the configuration process that there is a way to cause this to happen automatically on boot-up.

Now, I must confess, I am overwhelmed with the many features of Logger. I have only touched on the surface and realize that the hundred or so pages hold many surprises. To give you an idea of what is there, I will just tell you of an enthusiastic reader's comments.

I received an E-mail from Joey N9LQ the other day. He is using the PTC-II TNC and is an avid digital operator. He told me how he downloaded the free Logger program and started using it on all modes — and liked it so well that he has now deleted the commercial all-mode software he was using and just uses Logger.

I have another pending project. I looked through the program to find a configuration to address my old PK-232MBX. It is often a stranger to new programs. I will have to find the combination that works. Once I do, it looks like the program should be as effective as any other for all the modes supported by the 232.

Joey went on to tell of building the Lectrokit PSKI interface and how well it made his set-up work. Then he told of an "Enhanced Mixer" he down

Number 42 on your Feedback card

ON THE GO

Mobile, Portable and Emergency Operation

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Hurricane encore

With this being the December issue, I had originally planned on writing my Christmas wish list and telling my YF that since it was published, she would need to make sure that all the items were given serious consideration. Unfortunately (or fortunately?), this plan was overcome by events.

I'm writing this in mid-October, and although hurricane season doesn't officially end for another six weeks, most of us are more focused on fall activities such as shifting from "Back to School" to Halloween. Tropical storms are not in the forefront. Hurricane Irene was one of those storms that developed in the Caribbean Sea and moved toward the west coast of Florida. While the computer models for hurricanes that develop in the Atlantic are very impressive, those for storms in the Gulf or the Caribbean are less accurate. I guess with all the islands it is like projecting the path of a pinball. In any case, the lack of solid projections reminded me of SkyWarn during tornado season up in the Midwest: Just when you think something is going to happen soon, but there is no idea as to exactly where or when.

The National Weather Service asked us to bring up the SkyWarn net about 10:00 p.m. on Friday. Naturally, it is difficult (if not impossible) to do much storm spotting in the dark, but since flooding was the main concern, there was some good the ham community could do. The net was on the air until about 2:00 a.m., when everybody pretty much folded up — one of the hazards of having a disaster on a Friday night after a full week of work. The spirits were willing, but the flesh kind of wore out after a while.

Much of the heaviest weather hit during the early morning hours, with high winds and torrential rains. The next morning, the net came back up bright and early, and I rejoined it around 9:00 a.m. We were operating both SkyWarn and the emergency services nets concurrently on the same frequency. There was not a lot of traffic, but enough to keep me busy as net control. Although I have often acted as net control, I had a couple of surprises which I wish to share. As most jokes go, I'll give you the bad news first.

The night before the storm, when the weekly emergency net was scheduled, net control did not come up on the frequency at the appointed time. Since we rotate the net control duty, this happens occasionally, since even hams have unexpected commitments due to work, family, etc. Several stations called to ask if the net was going to be held but no one actually started it. I established the net and wondered why there were so few hams who were interested in taking net control duty.

The following few days during the Hurricane, I noticed a few examples of poor operation that did not seem to be in the true spirit of amateur radio. At that point, several impressions struck me. First, I know of people who have been excellent net control operators who no longer participate in that capacity. I suspect that some of them got tired of some of the hassles that can go with net control duty. Others who might be interested may be a little intimidated by the thought of trying to be net control; when they hear some of the inappropriate comments made on a net, this interest may be lessened. Here are some things to remember when part of a network in any capacity.

First, few if any of the participants on the net do this full-time. Everyone is a volunteer using skills normally associated with a hobby. These are skills that in an emergency are pressed into heavy-duty service, and it takes even a skilled operator some time to get into the rhythm.

Second, if this is a real emergency, the adrenaline is going to hamper everyone's ability to stay cool. Unfortunately, in a real emergency people can get injured or killed, and even the prospect of such an event can cause people to stammer or falter just a little. It's easy to chat on the way to work or rag-chew on the low bands. Handling traffic that may affect people's lives or homes takes a little more out of all of us.

Third, net control is often trying to handle multiple tasks at any given moment. It is common to be monitoring multiple frequencies — the frequency on which this particular net is operating, perhaps a frequency used for county wide command and control, a link to other counties or agencies, etc. If located at a government agency, there will be at least one public service frequency being monitored. Add to this the need to pass traffic received by telephone to the appropriate served agencies or handle face-to-face discussions with public service or emergency agency people, and things can get hectic.

Also, when a ham picks up the mike to handle a net, he or she does not forget about the health and safety of his or her own family. What you hear on a given frequency is only a small part of the activity that is occurring, so if net control occasionally seems distracted, he probably is.

Fourth, an emergency you report to the network may not be perceived as critically as you think it should be. During Hurricane Irene, a number of good-sized pleasure craft broke loose and were adrift and headed toward a bridge. These were duly reported through the net to the appropriate authorities. Because of far more pressing issues, these were summarily placed well down the list by the responsible

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"Enhanced Mixer" he loaded from [www.modemss.brisnet.org.au/~mlevoi]. I haven't done this as yet, but he claims he can make custom audio level settings for each band and call them up when he changes bands.

I will have to investigate this and let you know. I do notice a difference in audio settings between the voltage available when operating from battery power as opposed to the shack power supply. This requires audio level compensation. I find that the quickest way to the control panel in Windows95 is with a right click on the sound level icon at the bottom of the screen. However, there seem to be different versions of Windows and that may not work for all.

Another recent addition is a CD-ROM disk from QRZ. This arrived when only the laptop was available. On installation in the laptop, access to the disk through the Windows overlay was agonizingly slow. Then I found the DOS interface and the speed was reasonable. When installed in the desktop, it is blindingly fast. Sometimes it seems instantaneous when being accessed through a communications program such as Logger. I tried it with several programs. (Why did I not have one of these before?)

If you have questions or comments about this column, E-mail me at [jheller@sierra.net]. For now, 73, Jack KB7NO. 73

Number 43 on your Feedback card

Above & Beyond

VHF and Above Operation

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Microwave Update 1999

Just came back to San Diego from one of the best Microwave Update 1999 conferences that has ever covered amateur operations from 1 GHz to over 47 GHz and into light frequencies. The conference was held at the Harvey Hotel in Piano, Texas, on October 21st through October 24th. This fine conference was hosted by the North Texas Microwave Society and their members who, with the ARRL, were able to bring together amateurs from all over the world with one common interest, microwave communications.

The entire conference was directed to the premise of sharing technical knowledge and current developments through the microwave spectrum of our amateur frequency bands. For those that have never been to a microwave update conference, it is a semi-informal event sponsored and dedicated to amateur endeavors. Events scheduled include many speakers presenting papers and talks covering phase noise, microwave rover operations, 1296 VLNA computer design, laser communications, amplifiers, feedhorn designs, systems for 120 and 145 GHz, synthesizers, rain scatter, EME, new transceivers, loop yagis, TWTs, and AMSAT updates. And that only describes a portion of all the events that were cram-packed into four days of talks, swap meets, great Texas BBQs, technical noise figure and spectrum analyzer workshops, and an antenna workshop for feedhorn measurements and antenna gain measurements.

There were amateurs there from all parts of the globe, including Japan, New Zealand, Germany, England, and many more. All in all, it was a very successful conference, and the free forum and exchange of ideas and applications helped to bolster our continuing support of microwave interest to help promote usage of these very interesting frontiers.

While there were many very high end microwave systems operating into new frontiers above 24 GHz, there were also systems that were quite simple in operation, making a great blend of systems for everyone from the beginner to the experienced microwave amateur. For those that could not be there, a book of the entire proceedings was published by the ARRL that covers all the papers presented at the Microwave Update 1999 Conference. It's available from the ARRL as their #7725 (ISBN: 0-87259-772-5). I understand the cost is about $15. This book covers quite a bit of information and is about the size of an *ARRL Handbook*, with 620 pages of papers submitted by microwave amateurs covering a wide range of interests.

Let me take you on a short tour. We arrived at the Harvey Hotel on Thursday, the 21st, at about 4 p.m. in the afternoon. Due to our travel arrangements and time constraints, we had to miss the early program, which was a tour of the surplus dealers in the Dallas, Texas, general area that was conducted with the able help of Kent Britain WA5VJB.

We took a short tour of the hotel and met several old friends we had only communicated with before via E-mail or other methods before this great eyeball QSO. Settling in and a great supper got us ready for the conference proper and the opening session Friday morning, conducted by Al Ward W5LUA. Speakers were presenting topics all day long on a very large variety of topics. Additionally, in the afternoon, after the noon lunch break, a secondary event was held in the hall outside the meeting room. All amateurs were invited to drop off RF preamps, synthesizers, and other microwave networks for evaluation in the Noise Figure/Spectrum Analyzer/Network Analyzer/Phase Noise Test Equipment workshop.

I dropped off three items for evaluation, as did many others. The items I submitted for evaluation were a 10 GHz bandsawed Qualcomm 3-stage RF preamp, and 2 synthesizers, one for 2592 MHz, and one for 1152 MHz. The synthesizers were to be

public service agency. This is their job — they do it every day — and such decisions definitely belong to them.

Okay, those are the suggestions to improve our operating habits. The good news? At least 99% of the practices I encountered during the hurricane were outstanding. Many hams monitored and stood by ready to assist or pass traffic. Periodically, when things had quieted down, we would request a check-in. The first time I did, I was shocked to find over 50 stations available and on frequency. There was very little unnecessary communication; these folks just stood by until needed and then helped where they could.

I've always been just a little biased, and felt hams were special people with special skills. After last weekend, I'm sure there is no bias — it's just fact. Thanks to one and all.

evaluated for phase noise and the preamp for gain and noise figure. I knew ahead of time that the synthesizers were reasonably good, being some 50 dB down in phase noise products, but the preamp was a lark.

The preamp submitted was a surplus Qualcomm 3-stage commercial unit normally set to operate at 12 GHz. I bandsawed the metal housing with the preamp attached and had to convert it with two SMA connectors and two 1 pF chip caps between the circuit board traces and the coax connectors. DC power and -5 volt bias test leads were attached, and the unit was sealed in aluminum tape for shielding: this was all that was done. NO TEST OF OPERATION WAS PERFORMED — I wanted an evaluation of the pre amp "OUT OF THE CHUTE." Somewhat dangerous should the amp not function: however, it measured at 10368 MHz 26.4 dB gain, and a noise figure of 2.13 dB. Not bad for an untested commercial 12 GHz Qualcomm preamp obtained in surplus and operated on an amateur frequency. The phase noise of the synthesizers measured to just over 70 dB down, some 20 dB better than my simple test equipment could determine.

I don't have the figures on other devices submitted at this time, but there were 30 to 40 devices submitted for evaluation, making this event and service graciously conducted by the North Texas Microwave Society quite popular. Not only did they put on a great day of speakers on microwave, but they also conducted a very helpful workshop using some of the most sophisticated test evaluation equipment for microwave ever assembled at any one point for amateur use.

After this great schedule of events, an after-supper flea market and general bull session were conducted in the main conference room. I have to admit I have never seen so much microwave material assembled in any one place at any one time. The material offered for sale was so varied and covered many amateur bands up to about 40 to 50 GHz. Something for everyone. I have assembled material over many years of scrounging, but what I observed in this one room made my stuff look pale in comparison to the material offered for sale.

Saturday was a similar day that started off with the San Diego Microwave Group's presentations on synthesizers, a simple 2 GHz "Synplexer" presented by Ed Munn W6OYJ, and a 10 GHz transverter presented by Kerry Banke N6IZW. Later, the same workshop forum was held again for amplifiers, preamps, and such as was held on Friday. The evening program was a BBQ banquet for all. The main speaker was Joel Harrison W5ZN, Vice President of the ARRL, who put on a very humorous presentation spoofing protection and saving of a protected species, the "ARMADILLO," which suffered a sudden road-related tragedy. Joel brought the house to its knees.

After supper, a Texas two-meat BBQ of beef and chicken, there was an auction followed by a prize drawing for those in attendance at the banquet. This was a most unusual after-banquet drawing in that there were items for all. Not only were there prizes drawn at random pulled from a hat, there were enough prizes to offer a chance for every one in the banquet room to receive his choice of items on a table of prizes. A great idea, something for everyone. Not one person went away empty-handed — what a conference!

As the conference wound down, there were still events scheduled for those that could stay for the Sunday morning antenna measurement and dish feed test range. Needless to say, this required a large area in which to conduct antenna measurements tests. It was held in a back parking lot of the Harvey Hotel. Systems tested covered all aspects of operation, from 1 GHz to a system that functioned at 47 GHz.

Our San Diego Microwave Group tested a simple system called the "Synplexer," a play on words of Polaplexer and Gunnplexer combined with a Synthesizer for local oscillator injection. In its simplest form, it requires a coffee can antenna with 1/4 wave receive and transmit probes offset by 90 degrees. Coupled to this system was a modified synthesizer operation at 2302 MHz and receiving at a 146 MHz IF frequency. That means that the other system in use had to operate at 2448 MHz transmit and receive at its IF "146 MHz" for 2303 MHz. The 10 MHz oscillator providing clock to the synthesizer was modified to accept a small audio amp driving a varactor inside the 10 MHz tcxo oscillator for FM modulation on each end. The receive system at each end was a modified TVRO LNA for RF preamp use driving a single diode detector and connection at each end to a 2 meter HT for receive at 146 MHz, the IF frequency for full duplex voice communications.

This system was put together from flea market LNAs and other surplus materials to show that a simple system that has good communications range can be constructed for very little cost. In tests, the coffee can antennas could feed dishes but were used as the main antenna by themselves and showed about 6 dB gain. For communications in the 1/2 mile range, the antennas did not need to be pointed at anything in particular for good communications. Ed Munn W6OYJ and Kerry N6IZW demonstrated the system during the parking lot antenna measurements workshop. That's where Ed was able to make

HAMSATS

Amateur Radio Via Satellites

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Keeping up with changes in the world of amateur-radio satellites is a challenge. Long gone are the days of only one functional hamsat in the sky. Today there are over a dozen, and they vary dramatically in their operation, frequency usage, and orbit. The AMSAT General Meeting and Space Symposium has been a great source of information about what's happening now, and planned for the future.

The AMSAT Symposium

Duane Nagle KO6BT and his crew in San Diego hosted AMSAT's 17th Annual Meeting and Space Symposium. It was

[redacted]

the long-awaited announcement that Dr. Karl Meinzer has signed a contract with Arianespace (Tuesday, October 5, 1999). P3D will be on the first suitable *Ariane 5* launch as a secondary payload. Specific details were not made available in the press release of October 7th, but this is the major milestone that satellite enthusiasts have been waiting for. While it is possible that P3D may go to orbit as early as April, 2000, the wait for a ride could be longer. In the meantime, P3D will be shipped to Kourou, French Guyana, by the end of October. The satellite will then be checked out and stored as a "standby" passenger, ready

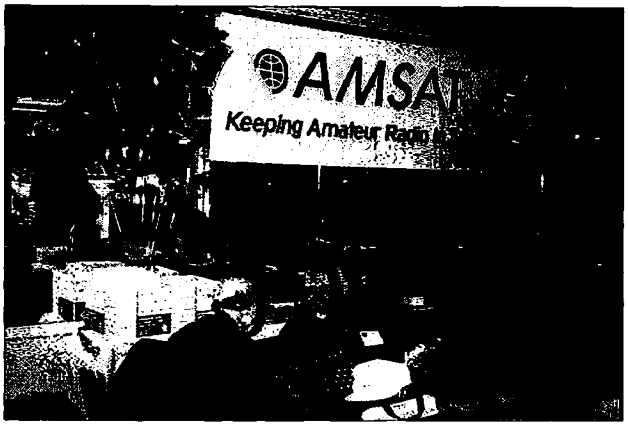


***Photo A.** The AMSAT 17th Annual Meeting and Space Symposium was held in early October at the Hanalei Hotel in San Diego, California.*

Kerry Banke N6IZW gave details on methods for modifying Qualcomm OmniTRACS surplus microwave equipment for use with amateur satellites. Kerry has been working with the gear mostly for terrestrial use, but the advantage of inexpensive high-quality surplus modifiable microwave equipment provides highly cost-effective units for possible hamsat work.

Kerry's talk was a good mix of understandable hardware modifications using some very advanced electronic microwave building blocks like synthesizers, reference oscillator modules,

mixers, and other items. The symposium proceedings give complete procedures for using the Qualcomm units on ham bands from 1.2 GHz up through 24 GHz. These are not good projects for novice-level kit builders, but it's getting cheaper and easier to get on the more esoteric microwave ham bands.

Dr. Bob Twiggs KE6QMD of Stanford came to tell us about OPAL, the Orbiting Picosat Autonomous Launcher. The program began in 1995 to build and launch a satellite that would act as the "mother ship" for a group of very small satellites called picosats (1 to 2 kg weight) to be ejected from "launcher tubes" after OPAL is in orbit. The rocket is a modified Minuteman missile.

Artemis is a group of female engineering students at Santa Clara University. They have built two picosats that are used to study VLF signal characteristics from orbit. They hope to differentiate between horizontal and vertical VLF signals generated by lightning storms from orbit. A third picosat was also built by the group.

STENSat was a result of Bob Twiggs' challenge to the attendees at the 1998 AMSAT Symposium in Vicksburg, Mississippi, to propose and build a picosat. Bob showed the symposium attendees a complete engineering model built by the STENSat crew. This Mode "J" (two meters up and 70 cm down) FM transponder-in-the-sky is small enough to fit in your back pocket. Bob demonstrated the antenna deployment system that unfurls the dipoles for the VHF receiver and the UHF transmitter.

A third group of picosat builders from the Aerospace Corp. have built two tethered satellites as a wireless radio communications demonstration.

Bdale Garbee N3EUA made a presentation about why AMSAT software should be freeware. This is a controversial issue, but Bdale used some historical background about how freeware via the Internet has actually helped AMSAT get more enthusiasts into the hobby. Bdale has been involved with many AMSAT projects and acknowledges the fact that much of AMSAT's income has been derived from satellite tracking software sales. Bdale pointed out that "open source" (almost free) software provides a means for the software to evolve by inviting users to become participants in the software development process and conversion for use in other operating systems. Bdale also pointed out that software that can freely evolve to provide features that have not yet been identified is software that will endure.

Assi Friedman KK7KX presented updates on the status of ASUSat1 and the upcoming launch with JAWSat, OPAL, and FalconSat. In addition to its digital communications system, ASUSat1 has a single-channel FM voice transponder. The Arizona State University efforts go beyond this, their first amateur satellite. More satellites are on the way for launch in 2001 and 2002, and testing efforts continue with small "CANSats" that are sent up on non-orbiting amateur rockets to test new systems designed and built by students. Assi was joined by Brian Underhill and others to provide details about the multitude of projects currently in production or design. Conference attendees were delighted with a video clip of a recent CANSat launch from Blackrock, Nevada.

Andrew Taylor KCØBPD is a senior at Colorado State University working on an electrical engineering degree. His presentation focused on the use of digital point-to-point protocol (PPP) communications for the Citizen Explorer Satellite project. Andrew pointed out that PPP is simple and inexpensive to implement. The Citizen Explorer satellite will be accessed via a ground stations in Colorado, New Mexico, and Alaska. Compared to the AX.25 data format commonly used by hams for packet

Photo B. *The weather was perfect, as were the facilities.*

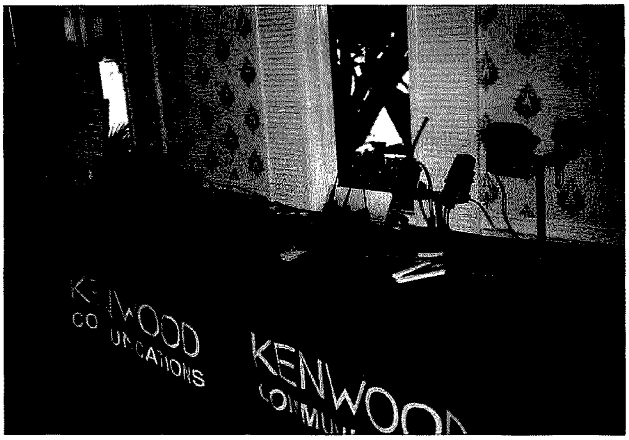


Photo C. *Kenwood had two representatives and a nice display of new radios at the Space Symposium.*

radio, the PPP protocol uses fewer packets and fewer overhead bits to get the data through. The satellite is an educational project designed to provide satellite measurements of local ozone and ultraviolet radiation for a worldwide student audience.

Cliff Buttschardt K7RR presented some simple yet effective methods of building 70-cm patch antennas on a budget.

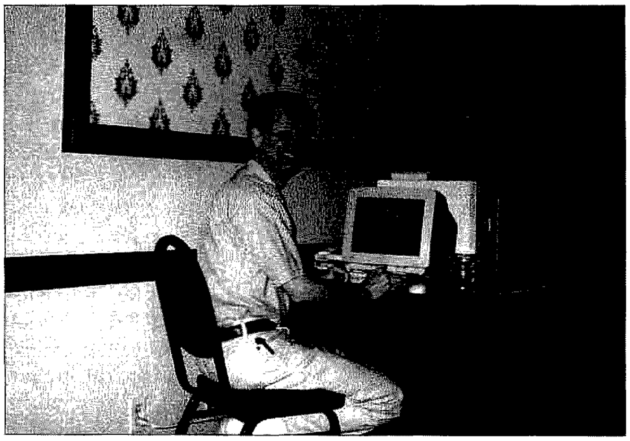


Photo D. *Bruce Paige KK5DO set up in the symposium meeting room to feed live audio via geosat and record the talks for Internet distribution from [http://www.amsatnet.com].*

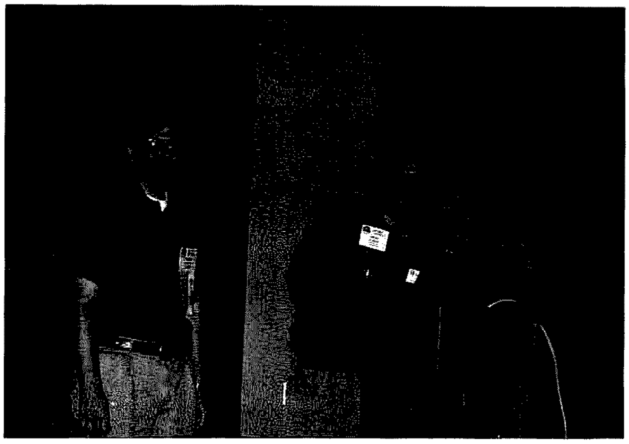


Photo E. Frank Bauer KA3HDO and Will Marchant KC6ROL provided updates on amateur radio systems designed for the International Space Station (ISS).

Cliff began with background information on how patch an-

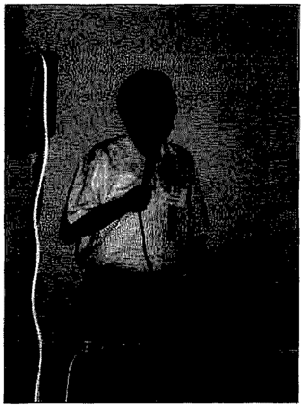


Photo F. Matjaz Vidmar S53MV came from Slovenia to present his interesting findings on "No-Tune Transceivers for the Microwave Bands."

tennas work and how to make them with circular polarization. The materials Cliff used were surplus road signs that are typically made from .060" aluminum-alloy sheets. Circular polarization is achieved by orienting the feed point at a specific spot on the patch. While one spot creates right-hand circular polarization (RHCP), a point on the opposite side of the patch will create a left-hand circular polarization (LHCP) orientation. To have a switchable-mode antenna, the two points for RHCP and LHCP are fed by coax to a simple RF relay. Cliff's paper in the symposium proceedings gives complete details on the methods and materials to use to make successful patch antennas.

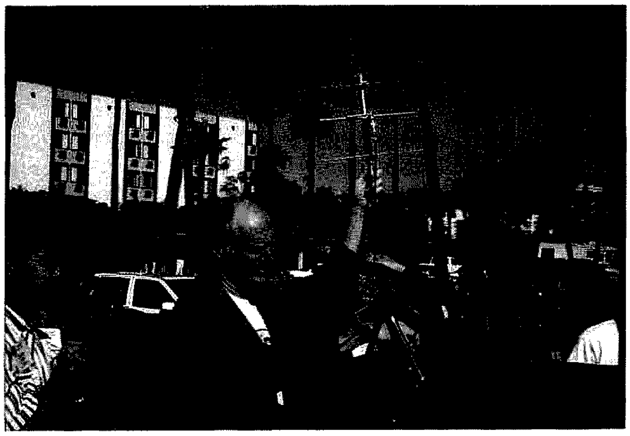


Photo G. Bob Bruninga WB4APR (APRS inventor) demonstrated portable 9600-baud digisat reception in the parking lot outside the symposium meeting room.

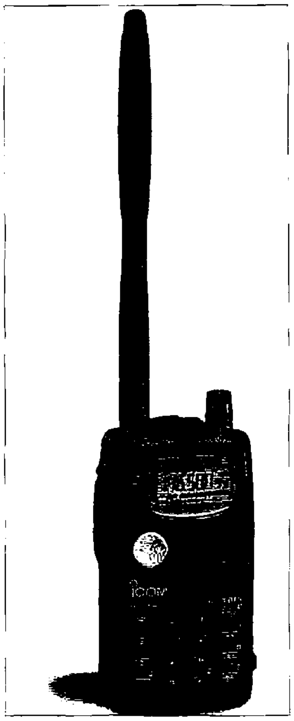
Randy Kohlwey N7SFI provided an update on the status of JAWSat, which at the time of the conference was at Vandenberg waiting for launch. Randy's talk began with a brief history of the Center for AeroSpace Technology (CAST) and its mission. JAWSat's goals include providing a physical platform for other satellites, e.g., OPAL, FalconSat and ASUSat, and to carry six video cameras with transmitter system, some scientific experiments, and an amateur-radio store-and-forward communications payload. The cameras are set to monitor the separation of the sub-satellites after orbital injection.

Anthony Monteiro AA2TX has developed a new software offering called Instant Tune for the Yaesu FT-847. Tony recognized an opportunity to create an automatic tuning system that would take care of Doppler adjustments during a satellite pass. Instant Tune works in conjunction with Instant Track satellite tracking software. Instant Tune will calculate the necessary corrections to both the transmit and receive frequencies during a satellite pass. The software will then apply these corrections directly to the radio through its computer connection port.

Originally the software was developed for the Kenwood CAT system. From there it was modified to support a multitude of radios and the various hardware interface restrictions. With the introduction of the FT-847 from Yaesu, Anthony targeted this new radio with his recent efforts. With Instant Tune running, the user simply sets his radio for the appropriate receive frequency and operates. Doppler shift is automatically addressed and satellite conversations become as easy as HF (shortwave) operation. Anthony did a live demonstration of his

Continued on page 50

New Products

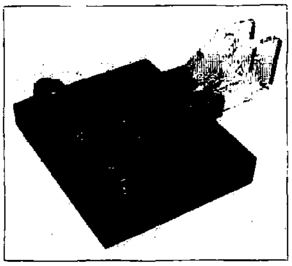


ICOM's IC-T81A Handheld

ICOM's newest handheld, the IC-T81A, boasts four bands, excellent audio, 124 memory channels, and water-resistant construction. At 2.3W x 4.2H x 1.1D inches, this rig weighs in at only 9.9 ounces and covers 6m, 2m, and 440 MHz at 5 W, along with 1.2 GHz at 1 W.

The IC-T81A uses a five-position joystick-type control for mode, tone, duplex, volume, band, scanning, and more. There are no function keys, so you can forget about memorizing those.

For further info, contact ICOM America, Inc., 2380 116th Ave. NE, Bellevue WA 98004; tel. (425) 454-8155; site [www.icomamerica.com].



Vibroplex Code Warrior Jr.

Now that the Cold War is over, Vibroplex has brought out the Code Warrior Jr., the production version of the Norcal K8FF key. As they say, for the "fist" time in their history, Vplex is offering QRP keys, and this one is destined to become a collectible.

Each Junior is uniquely serial numbered and dated, with black powder-coated bases, clear paddles, magnetic action, and NO springs. For price and other info, contact The Vibroplex Co., Inc.; 11 Midtown Park, E.; Mobile AL 36606-4141. Call (334) 478-8873 or fax (334) 476-0465.

Sun Visor Mike

These days ham radio is a hobby on the go. The advent of small, affordable mobile radios has allowed every amateur radio operator to take his hobby "on the road" with him. Still, one thing always gets in the way: the microphone.

It seems like the microphone is always either in the way or just out of reach. When you are driving down the road, it's not only annoying to have to dig around on the floor, mid-QSO, for the mike you just dropped, but it's also dangerous.

The PRYME MMC-100 "Sun Visor" microphone brings an end to all that. The MMC-100 is a unidirectional clear-sounding electret microphone mounted on a flexible gooseneck. It secures to the sun visor of your car, so it's always in place for all your ham radio mobiling. The Push-To-Talk switch for the microphone is located on an in-line box that can be mounted to the gear shift or arm rest, making mobile operation more convenient and safe than ever.

The MMC-100 is sold without a microphone cable. However, six different optional microphone cables are available to support all of today's popular HF and VHF/UHF base station and mobile radios. Just purchase whichever cable you need for your radio or radios. The cables are strictly plug and play; no soldering is required.

For more information about the PRYME MMC-100, contact Premier Communications Corp., 480 Apollo St., #E, Brea CA 92821; tel. (714) 257-0300; Fax (714) 257-0600; E-mail [premier@adi-radio.com]; site [www.adi-radio.com].

Free Software

HAMCALC version 40 has now been released by George Murphy VE3ERP. With many new upgrades, it includes over 200 painless math and design programs for radio amateurs and professionals alike. HAMCALC has been used worldwide as a reference and learning tool since its introduction in 1993. All programs have the option of working in either metric or imperial units of measure, and you'll find much information not readily available in current handbooks and literature.

HAMCALC is written in GWBASIC and requires a GWBASIC.EXE file in your root directory. For a free HAMCALC 40 3-1/2" MSDOS/Windows diskette, send US$5.00 for airmail shipping/handling anywhere in the world (US$6.00 for GWBASIC also) to George Murphy VE3ERP, 77 McKenzie St., Orillia ON L3V 6A6, Canada. E-mail George at [ve3erp@encode.com].

Never Say Die

continued from page 21

Guide to Wisdom, which reviews most of the above books.

Until you honestly try the procedure I've outlined, you won't know if or how much it could change your life. The body, given the right nutrients, and a positive attitude, is capable of incredible healing powers. Or would you rather keep suffering with a backache, arthritis, or whatever? My *Secret Guide to Health* explains how you can best care for your body, thus giving it an opportunity to repair itself. Now all you need to add is a positive attitude (known also as prayer). Please try this simple experiment for 60 days and let me know what happens. If the results are as spectacular as I expect, I'll need your help to get on the Tonight show.

Prayer really does work — just not the way most people think. I'll tell you what — maybe you'll take a half minute out of your day to help me? I would appreciate your prayer for me to help make my body healthier and younger, so I'll have more time to get the word to anyone who will listen. If coffee ice cream starts looking less attractive to me I'll know your prayers have helped.

Everything fits together so neatly that I'm very excited about this — but I'm depending on you to prove I'm right.

Bioprogress

I really appreciated getting a letter the other day from a 75-year-old reader who credited the bioelectrifier with completely curing her cancer. Her doctor couldn't believe the x-rays! But this was followed up by a call from another reader who owns four hospitals and who has

Continued on page 59

Photo H. Danny VA3JDH used a hand-held Arrow antenna to make voice contacts through SUNSAT-OSCAR-35 during a break in the talks.

HAMSATS
continued from page 47

system. It worked, even in front of a large audience. The software

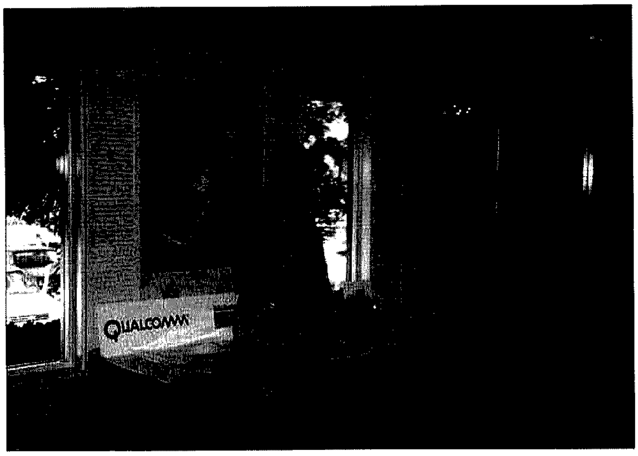


Photo I. AMSAT President Keith Baker KB1SF makes a free phone call using one of the Qualcomm satellite phones using the Globalstar satellite constellation.

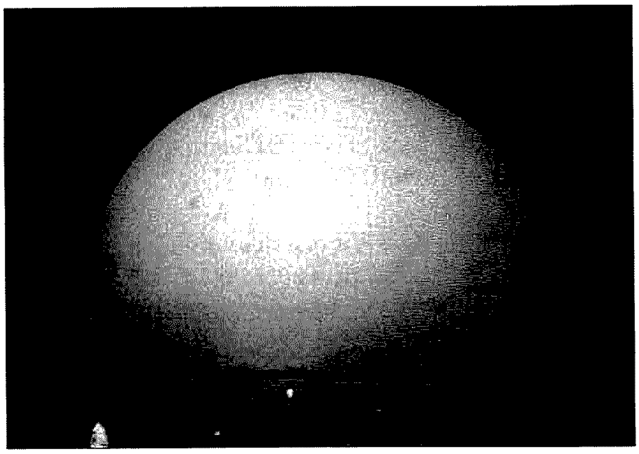


Photo J. The Globalstar control/communications dishes at Qualcomm in San Diego, California, are housed in inflatable domes like this one.

(and source code) are free and available from the AMSAT Internet site [http://www.amsat.org].

Dr. Paul Shuch N6TX ended the official day's talks with his "Anatomy of a SETI Hoax." Paul described some of the many inconsistencies that surfaced after various details surrounding a purported SETI (Search for Extraterrestrial Life) signal reception in late 1998. While Paul's talk covered a serious topic, his capability as a popular speaker brought some fun and humor to the presentation. Many individuals and groups around the world gave credence to the hoax until the details became public knowledge. Paul finished with a new folk song he wrote for the AMSAT gathering: "A Memorial to *MIR*."

Friday activities continued into the evening with two parallel sessions. One was a beginner's forum hosted by Gould Smith WA4SXM, with explanations of issues that confront new hamsat operators. Gould, with help from other long-time satellite enthusiasts, discussed orbit tracking software, ground-station equipment needs, and other basic topics.

In the room next door, Ray Soifer W2RS, AMSAT vice president for International Affairs, acted as master of ceremonies for an IARU (International Amateur Radio Union) satellite forum. Hans van de Groenendaal ZS5AKV, the IARU Amateur Satellite Advisor, gave an update on IARU activities over the past year, with emphasis on their impact on the international satellite allocations. Graham Ratliff VK5AGR, the IARU AMSAT Frequency Coordinator, discussed frequency coordination issues for current and future hamsats. The group unanimously reelected Graham to continue in his current position.

Frank Bauer KA3HDO, AMSAT vice president for Human Spaceflight Operations, discussed ARISS (Amateur Radio on the International Space Station) progress regarding callsigns for ARISS operation and other international concerns. Since the International Space Station (ISS) is indeed "international," it has been proposed that ham callsigns on ISS be licensed via the International Telecommunications Union (ITU), rather than individual countries.

The symposium continues

The Saturday presentations began in earnest promptly at 8 a.m. Duane Nagle KO6BT and his crew had everything ready to go. Bruce KK5DO was connected to the WØKIE network for the audio feed uplink to the Wisdom channel on C-band commercial satellite. Bruce had "Real Audio" recordings on his PC, but the Internet connection from the hotel was rather slow, so they were uploaded later to [http://www.amsatnet.com]. You can check out most of the symposium talks at this URL (Universal Resource Locator) on the Internet.

Jerry Smyth K8SAT made the first Saturday morning talk. Jerry described a satellite gateway station that he and other satellite enthusiasts have put on line in Detroit, Michigan. The system incorporates a computer-controlled IC-820 for the satellite side and an old crystal-controlled 220 MHz mobile rig to provide a link to a local two-meter repeater. His paper in the symposium proceedings gives basic information on the how and why of the project.

Dr. Bob Twiggs KE6QMD was on the schedule for a second talk on small satellites from the Department of Aeronautics and Astronautics at Stanford University and other educational institutions. Bob's Saturday presentation focused on the EMERALD Nanosatellite program with some historical perspectives. EMERALD consists of two separate satellites that are to fly in formation. Since these hamsat/edusats are scheduled for a space shuttle launch under

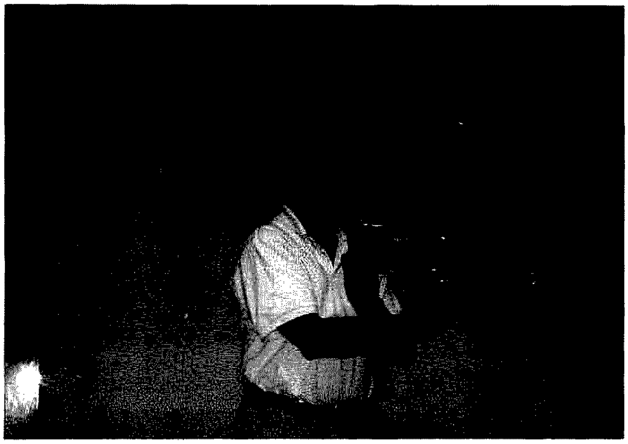


***Photo K.** Jim Benson, founder of SpaceDev, explained the design and functions of a scientific interplanetary probe designed by his San Diego–based company.*

the SHELS (Shuttle Hitchhiker Experimental Launch System) program, the EMERALD satellites will be in a relatively low orbit. The disadvantage is limited access time from the ground, but the advantage is that remote-controlled drag panels can be incorporated to adjust the ballistic characteristics of the satellite to achieve the desired formation flying. There is significant air at a few hundred miles up. That's why low-orbit satellites eventually reenter the atmosphere.

The ham-radio communications experiments on the EMERALD satellites include the use of 70-cm frequencies for digital inter-satellite and ground communications. While the ham connection is limited, it offers amateur radio operators an opportunity to monitor the links, download the data, and participate in the program.

Bill Burden WB1BRE gave a short description of the potential uses of amateur satellites in emergency communications. Unlike HF, satellite communication is much more predictable for long distance work. The disadvantage is that an amateur satellite is not always available, but can at least be used for communications at specific times during any given day.

Matjaz Vidmar S53MV joined the group in San Diego to present his paper on "No-Tune Transceivers for the Microwave Bands." His tremendous technical expertise and excellent command of English, coupled with a keen sense of humor, delighted the audience. Matjaz and his group in Slovenia have produced hundreds of no-tune kits for hams in Europe covering the microwave bands from 1.2 to 10 GHz. His talk focused on the simple construction methods, inexpensive components, and innovative designs for his SSB and data transceivers.

Bob Bruninga WB4APR not only provided satellite demonstrations in the parking lot outside the Hanalei Hotel, but also gave a very informative talk about "AMSAT Builders' Channels for HT and Mobile Satellite Communications." Bob has proposed for some time that the rather under-utilized 1200-baud Pacsats like AMSAT-OSCAR-16, LUSAT-OSCAR-19 and ITAMSAT-OSCAR-26 allow UI (unconnected) packet digipeat activity for APRS (Automatic Position Reporting System) operation. In addition to simply sending position information for ground stations that have done very simple modifications to their packet TNCs (Terminal Node Controller) for Pacsat uplinking, short messages of any nature are supported by the APRS protocol. Bob demonstrated the innovative APRS functions in the Kenwood TH-D7 HT and also showed the new dual-band mobile radio with APRS that Kenwood will have available by the end of the year.

Although not on the published schedule, Hans van de Groenendaal provided an excellent synopsis of the capabilities of SUNSAT-OSCAR-35 and its early days in orbit. S-O-35 has been a great new hamsat resource since launch earlier this year. The university experiments are typically run during the week, and ham transponder activity is becoming a common weekend activity. The most popular ham use has been the FM single-channel transponder. It can be programmed for either Mode "B" (70-cm up and two meters down) or Mode "J" (two meters up and 70-cm down). Hans also announced a new award from AMSAT South Africa called the Sunsat Award.

Frank Bauer KA3HDO, AMSAT vice president of Human Spaceflight Operations, and Will Marchant KC6ROL, STS-93 SAREX Operations Manager, teamed up to discuss amateur radio on the International Space Station with references to the SAREX (Shuttle Amateur Radio EXperiment) program and its historical precedents. There are many ham activities slated for ISS, including HF, VHF, and UHF frequency coverage. Modes will include voice, packet, SSTV (Slow Scan Television) and FSTV (Fast Scan Television).

While Frank covered the overall program, Will mentioned some specific operations, especially the Express Pallet program. This is a unit that resembles a satellite, except that it is attached to the side of the station and contains a number of experiments and communications systems that can be controlled from the station or from Earth.

On STS-101, the space station 2A-2 mission scheduled for January or February, 2000, some VHF and UHF ham gear will be taken to orbit for voice and packet. The external antennas will be attached to the service module of the station on a subsequent flight, later in 2000. Until then, there are two other antennas that can be used for ham operations.

Lou McFadin W5DID joined Frank and Will at the podium to show and describe the dual-band (two meters and 70 cm) antenna to be used on the station. It is basically a quarter-wave flexible steel whip cut for two meters. It was then covered with Kapton tape and some tuning stubs mounted on the bottom to provide a good match on 70 cm. The material used for this antenna was from a surplus steel measuring tape left over from

***Photo L.** Taking a break during the AMSAT board of directors meeting, from L to R: Chairman of the Board Bill Tynan W3XO, First Alternate Mike Gilcrest KF4FDJ, AMSAT President Keith Baker KB1SF, and AMSAT Treasurer Art Feller W4ART. Why is that sign over Keith's head?*

the AMSAT Microsat program 10 years ago. The Microsat antennas, and even the 10-meter dipole on AMSAT-OSCAR-6 (nearly 30 years ago), all incorporated steel tape measure elements.

Lou McFadin W5DID kicked off the discussion about Phase 3D. The spacecraft is complete and ready for shipment to South America to await launch on an *Ariane 5*. Lou pointed out that the satellite has components built by hams all over the world. Chuck Green NØADI showed slides taken before, during, and after the thermal/vacuum and vibration tests in Maryland.

The annual meeting and more

Every year at the AMSAT Space Symposium, the final official activity is the annual meeting. With a launch contract in hand, the focus of the organization has changed gears. AMSAT's focus is to get the satellite shipped out and successfully into orbit. AMSAT has done well financially, but there are still many unforeseen expenses that will face the organization in the year 2000. AMSAT president Keith Baker KB1SF and board chairman Bill Tynan W3XO provided some insight on what the upcoming year will mean to AMSAT. Reserve funds will be tapped, but with a definite goal in sight, the launch of Phase 3D, additional support from the amateur-radio community may be forthcoming. The meeting ended on an upbeat note and the evening continued.

Jim Benson, the chairman of SpaceDev of San Diego, was the keynote speaker at the AMSAT banquet. Mr. Benson provided some thought-provoking ideas about the commercialization of space.

His company is working to provide transportation for scientific instrumentation to Earth orbit, the moon, Mars, and even nearby asteroids. His premise is that the cost of small missions can be held to levels much lower than those that directly involve government agencies.

After dinner, there were two more fun events. The AMSAT awards presentations are a means of recognizing the many volunteers who have distinguished themselves during the previous year with their efforts on behalf of AMSAT. Following the plaque presentations, prize drawings take over. Last year, there were so many prizes that almost everyone won something, whether it was a rig or coffee mug. This year, the San Diego group gave out dozens of daily prizes throughout the day on Friday and Saturday. The two dozen prizes that were left for the banquet were spectacular. New radios from Kenwood and Alinco topped the list of grand-prize offerings. Kenwood was also responsible for hats and special cloth bag/portfolios for all conference attendees.

Travel and tours

Three time-staggered tour groups took off for Qualcomm and SpaceDev on Sunday morning. Symposium attendees were already intimately familiar with some of Qualcomm's most recent products, portable and hand-held phones that worked with the Qualcomm GlobalStar satellite network. Qualcomm set up three GlobalStar phones outside the symposium meeting room for free use, including long-distance call. Boxes of hand-held satellite phones were also available for use outside. It was great fun, and the phones and connections were excellent. At the Qualcomm facilities, we got to see the labs where the phones were built, repaired, and tested. A tour of one of the radomes for a GlobalStar communications dish was a unique experience. More information about Qualcomm and the GlobalStar system can be found on the Internet at [http://www. qualcomm.com].

After a short drive, the tour continued on to the SpaceDev facilities. SpaceDev has been described in the media as the world's first private space program. They have been in the business for a little over three years and have recently moved into a renovated indoor gun range with plenty of space for offices, meeting rooms, a clean room, and labs. The tour visited all of their facilities and included a presentation by Jim Benson, their founder, chairman and CEO, with supportive information from Rex Ridenoure, the chief mission architect. As a company they have not yet built any hardware that is in space, but many of the individuals in SpaceDev have. Their vice president of Space Engineering is Jan King W3GEY. Jan has been the key developer of many amateur-radio satellites, and in recent years, several commercial projects. Check out [http:// www.spacedev.com].

More meetings

Sunday afternoon marked the beginning of the AMSAT board of directors meeting. There were many topics for discussion. A complete transcription of the issues and resolutions will be available in the *AMSAT Journal*. A few of the major items included Phase 3D activities, the MOST project, ham radio on the International Space Station, and upcoming hamsats built by educational institutions.

With a launch contract in hand, AMSAT is now focused on the final preparation efforts to ship the satellite to Kourou. The Orlando lab personnel will complete final spin balancing and checkout with P3D project manager Karl Meinzer DJ4ZC and his group.

AMSAT-NA volunteers are currently working with Robert Zee VE3REZ, the Space Flight Laboratory Manager at the University of Toronto Institute for Aerospace Studies, as mentors for the MOST (Micro Oscillations of STars) satellite. The main payload is a small, fully steerable telescope system. The amateur-radio payload will include an L-band (1.2 GHz) and S-band (2.4 GHz) communications system (wideband DSP-based) coupled to a wideband remote-controlled receiver for propagation studies. The ham hardware is to weigh about four pounds, gets five watts of DC power, and fits into an 8.5- by 11- by 1-inch area of the satellite. The ham package has been dubbed "LEAST" for Lots of Extra Amateur Stuff on the Telescope. While MOST does not yet have a ride to space, launch is hoped for in 2001.

The flurry of new small satellites, built by universities and operating in the ham bands, has generated some concern in the amateur-radio community. The AMSAT board of directors has been monitoring these projects for years and has published guidelines on what is, and what is not, a "hamsat." With the recent debacle of SwatchSat/Beatnik, the small sputniklike satellite with commercially-oriented voice messages, AMSAT and universities with small satellite programs have been careful to stay within reasonable and legal bounds. The hamsat guidelines can be found at the AMSAT home page on the Internet: [http://www.amsat.org].

The board of directors meeting left all participants with an upbeat, enthusiastic feeling about AMSAT's projects for the upcoming year. Phase 3D has a future. New amateur-radio satellites from many sources have been launched in 1999, are being built, or are in design. Next year's meeting will be held in Portland, Maine. Plan to attend now.

A vast array of hamsats is now in orbit. The best way to prepare for Phase 3D is to operate via the current hamsat fleet. The "Proceedings of the AMSAT-NA 17th Space Symposium" is available from AMSAT [(301) 589-6062] for $15.00. Many of the talks can be heard via the Internet at [http://www. amsatnet.com]. Information about current satellites can be found at [http://www.amsat. org]. Check it out!

Calendar

Listings are free of charge as space permits. Please send us your Calendar item two months in advance of the issue you want it to appear in. For example, if you want it to appear in the March issue, we should receive it by December 31. Provide a clear, concise summary of the essential details about your Calendar item.

JAN 8

LOVELAND, CO The Northern Colorado ARC will host their Superfest from 9 a.m.–3 p.m. at the Larimer County Fairgrounds, 700 Railroad Ave. VE exams, commercial exhibits, computers, radios and more. Reserve tables from *Michael Robinson N7MR, (970) 225-7501; or [michael@frii.com].* Talk-in on 145.115 (-100 Hz) or 146.52. For detailed information, see the Web page at *[www.info2000.net/~ncarc].*

JAN 15

ST. JOSEPH, MO The 10th annual Northwest Missouri Winter Hamfest will be held on Jan. 15th. 8 a.m.–3 p.m. at the Ramada Inn in St. Joseph. There will be special room rates for hamfest participants. The motel is located at I-29 and Frederick Ave. (exit 47 on I-29). Talk-in on 146.85 and 444.925. VE exams, major exhibitors, and flea market all indoors. Free parking. Admission $2 each or 3 for $5 in advance; at the door $3 each or 2 for $5. Swap tables 6 ft. by 2.5 ft. are $10 each for the first two tables, 3 or more for $20 each. This includes two chairs and a ticket. Commercial exhibitors welcome, write for details: *Northwest Missouri Winter Hamfest, c/o Dick Merrill KCØAMY, P.O. Box 1533, St. Joseph MO 64502; or call (816) 279-2304.*

JAN 16

HAZEL PARK, MI The Hazel Park ARC will hold their 34th Annual Swap & Shop at the Hazel Park High School, 23400 Hughes St., Hazel Park MI. Open to the public 8 a.m.–2 p.m. General admission is $5 in advance or at the door. Plenty of free parking. Tables are $14 each and reservations for tables must be received with a check. No reservations by phone. Talk-in on 146.64(-) the DART reptr. For more info about the swap, tickets or table reservations mail with an SASE to *HPARC, P.O. Box 368, Hazel Park MI 48030.*

YONKERS, NY The Metro 70 cm Network (WR2MSN) will present their Computer and Electronic Flea Market at Lincoln High School, Kneeland Ave., Yonkers NY, starting at 9 a.m. Vendor setup at 7 a.m. Free parking. Admittance is $6; under 12 years free. Talk-in on 440.425 PL 156.7; or 146.910 PL 114. Vendors should call *WB2SLQ after 7 p.m. at (914) 969-1053; or E-mail [Wb2slq@juno.com]* to register. This show will be held all-indoors.

JAN 23

BABYLON, NY A special day of education for amateur radio will be held on Long Island on Sunday, Jan. 23rd, 2000. This event will include technical forums on all aspects of amateur radio. It is not a flea market or hamfest. There will be no items for sale. Some of the forums will be on license restructuring, antennas, DXing, contesting, purchasing amateur radio equipment, packet, FLEX-NET, ARES, APRS, satellite communications, and QRP (low power). There will also be a YL forum on issues concerning women amateur radio operators, and even more forums for everyone. In addition, there will be information booths for all the participating amateur radio clubs in the New York City/Long Island area, as well as booths for the ARRL, QCWA, a tune-up clinic and DXCC/WAS card checking. The event is "Ham Radio University 2000" and will be held Sunday, Jan. 23rd at the Babylon Town Hall Annex on Phelps Lane in Babylon NY. It will be open to the public 9 a.m.–3 p.m. Donation $2.00. Spouses, and children under 12 will be admitted free. Ample free parking. For more info contact *Phil Lewis N2MUN at [lewisp@hazeltine.com] or call (516) 226-0698.* The talk-in will be on the Great South Bay ARC repeater on 146.685, 136.5 PL.

JAN 30

DOVER, OH The Tusco ARC Hamfest will be held at the Ohio National Guard Armory, 2800 North Wooster Ave., Dover OH. Exit Interstate 77 at Exit #87 (Strasburg). Turn right at the exit stop sign, heading south on County Road 74 to the first traffic light. Continue through the traffic light intersection. The armory is on the right. Talk-in/check-in on 146.730(-). Admission is a $3 donation at the door. Dealers admitted at no charge. Tables are $10 each. The building opens at 6 a.m. for setup and will be open 8 a.m.–1 p.m. for the public. Food will be available on site, and after 7 a.m. at the restaurant next door. An ARES forum will also be featured. For more info and to reserve tables, contact *Billy L. Harper KB8CQG, P.O. Box 80407, Canton OH 44708. Tel. (330) 484-4634; Fax: (330) 484-4683; E-mail [bharper@neo.rr.com].*

FEB 11–13

ORLANDO, FL The Orlando ARC will sponsor the 53rd Orlando Hamcation Show and the ARRL State Convention, at the Central Florida Fairgrounds, located on Rt. 50 Colonial Dr., 3 miles west of I-4. Open Fri., Feb. 11th, 5 p.m.–9 p.m.; Sat., Feb. 12th, 9 a.m.–5 p.m.; and Sun., Feb. 13th, 9 a.m.–3 p.m. Over 150 commercial booths, over 400 swap tables. RV camping with elect. and water, $16 per night in advance or $20 at the gate. Admission $7 in advance or $9 at the gate. Commercial booths $225, swap tables $35 in advance or $45 at the gate. Tailgate $25 in advance or $35 at the gate. Price is for three days. Setup Fri., Feb. 11th 9 a.m.–4 p.m. Talk-in on 146.760(-). VE exams, must register in advance. Call *Gil Lineberry at (407) 843-4112.* You can join the foxhunt by registering by 4 p.m. at the info booth. Seminars, lectures, demonstrations, and special guest speakers. Check the Web site for up-to-date info at [www.oarc.org/hamcat.html]. Contact *Ken Christenson, 5548 C Cinderlane Pky., Orlando FL 32808; tel. (407) 291-2465; or E-mail [KD4JQR@arrl.net].*

FEB 13

MANSFIELD, OH The Mansfield Mid*Winter Hamfest and Computer show will be held Sun., Feb. 13th at the Richland County Fairgrounds in Mansfield. Doors open to the public at 7 a.m. Tickets are $4 in advance, $5 at the door. Tables are $10 in advance, $12 at the door, if available. Advance ticket/table orders must be received and paid by Feb. 1st. For additional info on advanced tickets or tables, send SASE to *Pat Akerman N8YOB, 63 N. Illinois Ave., Mansfield OH 44905; or tel. (419) 589-7133.* For talk-in call W8WE on 146.34/.94.

SPECIAL EVENTS, ETC.

DEC 10–11

BETHLEHEM, IN The Clark County ARC will operate W9WWI, 1500Z Dec. 10th–2200Z Dec. 11th in celebration of the Christmas season. Operation will be on General 75, 40, and 20 meters. QSL with an SASE for a certificate to *CCARC, 1805 E. 8th St., Jeffersonville IN 47130 USA.*

DEC 31–JAN 2

AUSTIN, TX The 3M ARC (W3MRC) of Austin TX will operate using the special callsign W2T, 1100 UTC Dec. 31st–2400 UTC Jan. 2nd. SSB operation will be on 7.230, 14.340, 21.410 and 28.350 MHz. For a certificate, send a large SASE with 2 stamps (see Web site for details). Send QSL to *3M ARC—W3MRC, A147-5S-03, 6801 Riverplace Blvd., Austin TX 78726-9000 USA.* See *[www.qsl.net/w3mrc]* for more info.

1999 ANNUAL INDEX

Cutting Edge Enterprises	PowerPort PocketPRO™	Staff	JUL 48
Cutting Edge Enterprises	PowerSafe 2000	Staff	OCT 48
Cutting Edge Enterprises	Quick Draw Holster	Staff	OCT 48
Cutting Edge Enterprises	The Radio Badge	Staff	SEP 48
Cutting Edge Enterprises	World Pack™ backpack	Staff	JUN 48
Dynamic Electronics	LP-1 Lightning Surge Protector	Staff	MAR 48
George Murphy	HAMCALC v.38 diskette	Staff	JUL 48
Glen Martin Engineering	Roller bearing set	Staff	JAN 48
HAL	DXP38	Staff	FEB 48
Hamtronics	Low-Noise Receiver Preamps	Staff	NOV 48
Hamtronics	LPN series preselectors	Staff	AUG 48
Hamtronics	UHF Exciters and Recvrs. T304, R304	Staff	JUN 48
ICOM	IC-T81A Handheld	Staff	DEC 48
ICOM	IC-706MKIIG All mode rig	Staff	JUN 48
ICOM	IC-2800H dual-band FM Xceiver.	Staff	NOV 48
Jensen Tools	Latest catalog	Staff	JAN 48
MCM Electronics	Free Catalogs	Staff	MAY 48
MFJ	Dual-band VHF/UHF SWR/pwr meter	Staff	SEP 48
MFJ	HamGear™ Tactical Chest Harness	Staff	MAY 48
MFJ	Helping Hands bench assistant	Staff	OCT 48
MFJ	Helping Hands tool kit	Staff	OCT 48
MFJ	MFJ-125 DXer's Dream 24-hr clock	Staff	JUL 48
MFJ	MFJ-126 quartz wall clock	Staff	OCT 48
MFJ	MFJ-731 RF measurement filter	Staff	JUN 48
MFJ	MFJ-801 Field Strength Meter	Staff	AUG 48
MFJ	MFJ-922 VHF/UHF antenna tuner	Staff	MAR 48
MFJ	Model 1817 HT antenna	Staff	MAY 48
MFJ	MFJ-291I and K HandyPal™ Earbud	Staff	JAN 48
MFJ	MFJ-4125 MightLite™ SPS	Staff	SEP 48
MFJ	MFJ-8121 World Band Receiver	Staff	JUN 48
MFJ	Super Ni-MH AA batteries	Staff	SEP 48
MFJ Publishing	Ladder Crystal Filters	Staff	SEP 48
MFJ Publishing	Radio Components Handbook	Silva	FEB 48
Mirage	B-320-G BruteFORCE™ amplifier	Staff	MAR 48
Morse Express	Chinese Army (PLA) Keys	Staff	JUL 48
Morse Express	Quadriom TA-1 dual paddle	Staff	OCT 48
Murphy	HAMCALC version 40	Staff	DEC 48
NCG Company	Comet CA-HV & CA-UHV mobile ants.	Staff	SEP 48
NCG Company	Natcomm MH-510 HT Tribander Ant.	Staff	AUG 48
Orion Microsystems	NEC4WIN95 antenna simulations sftw.	Staff	JAN 48
Peet Bros.	Weather stations	Staff	FEB 48
Premier Communications Corp.	PRYME MMC-100 Sun Visor Mike	Staff	DEC 48
RF Nulink	9600B Wireless Networking Base Sta.	Staff	FEB 48
Sescom	LAB Box-IT enclosures	Staff	SEP 48
Silver Lake Tech.	Print Screen Works software	Staff	AUG 48
Svetlana Electron Devices	3CX800A7, 8874/3CX400A7 triodes	Staff	MAR 48
Timestep	PROsat for Windows "i"	Staff	MAY 48
Tippecanoe	Model ZK-1 Key	Staff	NOV 48
Tippecanoe Radio Co.	Navy Model ZR-1 Crystal Radio Set	Staff	SEP 48
The Radio Works	T-4G Line Isolator™	Staff	JAN 48
Vibroplex	Code Warrior Jr.	Staff	DEC 48
Wahl Electronics	EZ-Torch	Staff	JAN 48
Wavesure, LLC	Nighthawk Microlight II	Staff	NOV 48
Power Supplies			
Emergency Power for Hams	Gas, Wind, Solar	WA8YKN	JUL 10
HT Porta-Power Project	Portable extended power pkg. for HTs	WB3CEH	OCT 15
The Evolution of Power Supplies	Part 2: Switching techniques	W6WTU	JAN 21
Tracking Dual-Voltage Power Supply	Build something handy	W6WTU	FEB 55
Your Batteries Ready for Y2K?	Electrifying tidbits...	N7MGT	NOV 28
QRP			
It's Senior Spider vs. Y2K!	Build this QRP rig now—just in case.	WA8TXT	JUL 34
Mods for the OHR 100A	Make a popular QRP rig even better	W4LJD	FEB 30
QRP	Hybrid ICs	WB8VGE	FEB 45
QRP	Design your own PC board	WB8VGE	MAR 44
QRP	Demise of the packet modem kit	WB8VGE	MAY 52
QRP	PC board using photo resist method	WB8VGE	JUN 50
QRP	SST CW transceivers	WB8VGE	SEP 53
QRP	Heathkit HW-8	WB8VGE	OCT 41

QRP	More HW-8	WB8VGE	NOV 51
Radio Fun in the Sun	Complete solar-powered QRP station.	W7DE	AUG 30
Simple Direct-Conversion Receiver	For QRPers and receiver aficionados	Sellen	SEP 38
Radio Direction Finding, Fox Hunts			
Homing In	A banner year	KØOV	JAN 52
Homing In	Mobile T-hunting, international-style	KØOV	FEB 42
Homing In	A rechargeable alternative	KØOV	MAR 42
Homing In	Dayton, Portland, and South Texas	KØOV	MAY 45
Homing In	Grungebusters; RACES to the rescue	KØOV	JUN 45
Homing In	Four centuries of foxhunting	KØOV	JUL 47
Homing In	Dayton does DF	KØOV	SEP 54
Homing In	ARDF Championships	KØOV	OCT 54
Receivers			
We Must Be Dreaming	Home-brew receiver project	Duncan	FEB 10
Reprints			
Instruction Instructions	Discover hidden savings ...	N6HYK	AUG 35
Read All About It!	Part 1 of Techno-Trivia	K8JWR	DEC 26
The History of Ham Radio	Parts 1 and 2: to 1920	Shalkhausser	OCT 31
The History of Ham Radio	Part 3: 1920–21	Shalkhausser	NOV 41
You, Too, Can Be an SOB	Hams should be heard but not seen	K9AZG	JUL 27
Reviews (by manufacturer)			
Central Machinery	12-inch Shear, Press Brake, Slip Roll	W7DE	AUG 34
Elecraft	K2 radio receiver kit	W3DX	MAR 37
Hamtronics	T301 — Our Exciting New Fox	WB9RRT	MAY 20
ICOM	IC-706MKII Shack-in-a-box	W2BLC	FEB 28
Idiom Press	Logikeyer III Memory Keyer	W3DX	MAR 39
Oak Hills Research	OHR 100A single band transceiver kits	W3DX	MAR 39
Oak Hills Research	OHR 500 5-band CW transceiver kit	W3DX	MAR 38
Oak Hills Research	WM-2 QRP Wattmeter kit	W3DX	MAR 38
Small Wonders Labs	Small Wonders WM-20 SSB Xcvr. kit	AC4HF	NOV 32
Small Wonders Labs	SW+ transceiver kit	W3DX	MAR 38
Ten-Tec	1254 Microprocessor-controlled Rcvr.	WB8VGE	JUL 28
Wilderness Radio	KC2 multifunction accessory kit	W3DX	MAR 39
Wilderness Radio	NorCal 40A kit	W3DX	MAR 39
Wilderness Radio	Sierra multiband superhet transcv.	W3DX	MAR 39
Reviews (by product)			
12-inch Shear, Press Brake and Slip Roll	Central Machinery	W7DE	AUG 34
K2 radio receiver kit	Elecraft	W3DX	MAR 37
IC-706MKII Shack-in-a-box	ICOM	W2BLC	FEB 28
KC2 multifunction accessory kit	Wilderness Radio	W3DX	MAR 39
Logikeyer III Memory Keyer	Idiom Press	W3DX	MAR 39
NorCal 40A kit	Wilderness Radio	W3DX	MAR 39
OHR 100A single band transceiver kits	Oak Hills Research	W3DX	MAR 39
OHR 500 5-band CW transceiver kit	Oak Hills Research	W3DX	MAR 38
Sierra multiband superhet transceiver	Wilderness Radio	W3DX	MAR 39
SW+ transceiver kit	Small Wonders Labs	W3DX	MAR 38
T301 - Our Exciting New Fox	Hamtronics	WB9RRT	MAY 20
Ten-Tec 1254	Ten-Tec	WB8VGE	JUL 28
WM-20 SSB transceiver kit	Small Wonders Labs	AC4HF	NOV 32
WM-2 Wattmeter	Oak Hills Research	W3DX	MAR 38
Satellite Operation, EME, Space			
Hamsats	16th Annual Space Symposium	W5ACM	JAN 46
Hamsats	Sputnik 41; RS-18; SATEDU	W5ACM	MAR 53
Hamsats	MIR, MIR SSTV, SAREX, SAFEX	W5ACM	MAY 43
Hamsats	Delta II launcher, ARGOS, ORSTED	W5ACM	JUN 42
Hamsats	UoSAT 12, RS-19	W5ACM	JUL 45
Hamsats	SUNSAT-OSCAR-35	W5ACM	AUG 50
Hamsats	Field Day 1999; Portable toys	W5ACM	SEP 50
Hamsats	JAWSAT, ASUSat-1, OPAL, FalconSat	W5ACM	OCT 51
Hamsats	Keeping up with the changes.	W5ACM	DEC 45
My Old Kentucky (Satellite) Home	Satellite antennas	KA9SOF	JUN 33
Test Equipment			
Basic Transceiver Tester	A good beginner's project	WB9YBM	NOV 26
Home-Brewing a 3 kW+ Dummy Load	Check out your big gun amplifier	W2CQM	MAY 22

NEVER SAY DIE

continued from page 48

been mercilessly harassed by FDA teams and the AMA just for experimenting with the bioelectrifier. His results, with cancer, HIV, and so on, have been so spectacular that he's opening a clinic in Costa Rica to get away from the FDA threats and to make this marvelous way of saving lives available to more people.

Yes, I know, when I started writing about the bioelectrifier (blood purifier) back in 1994, you thought Wayne was nuts again. I'm used to that. Well, it saves many readers from bothering to think or do any homework. I was crazy when I predicted that the whole world would want to share our repeater technology. Back in 1969 I was making phone calls anywhere I wanted with my Motorola HT-220 from the New Hampshire ski slopes via my repeater. Then I was able to do the same when skiing in Aspen. I was so excited that I published hundreds of articles and book after book on repeaters. The result of the ham development of repeater technology was the worldwide cell phone system of today. Crazy Wayne.

Then the first microcomputer came along a few years later. The computer industry bigwigs said they were toys and that I was crazy when I said they'd eventually be in millions of homes and be on just about every desk in businesses. Those bigwigs are all out of business now.

The music and hi-fi magazines all sneered at CDs. Crazy Wayne started *CD Review*, which soon became the biggest music magazine in the world.

Have you built a bioelectrifier yet? What's stopping you? The parts cost under $20. Maybe you're waiting until your lifestyle knocks you on your ass before I'm able to get your attention. I've published two articles on how to build the device, but they're all sold out. The Miller circuit, plus a simpler one by Bob Beck, are in the *Bioelectrifier Handbook*, which is $10. See my ad on page 63. This book includes instructions on how to use it.

The electronically challenged can buy a Plant Growth Stimulator unit for $155 ppd. from Butterfly Products, Box 1729, Hillsborough NH 03244. It has essentially the same circuit and will, if you use it as intended, stimulate the hell out of your plants. This unit also includes pure silver wire and will make silver colloid for you.

Or you can get in touch with me for the address of the clinic in Costa Rica and save yourself the trouble of building a bioelectrifier.

A better approach, I feel, is to change your lifestyle so you won't need emergency repairs. Why wait until cancer, a heart attack, stroke, diabetes, arthritis, multiple sclerosis, and so on have hit?

And one of 'em surely will unless you make some big changes.

In All Fairness

An Irish television producer called. He was doing a program commemorating the Moon landings of thirty years ago, and one of his crew was a ham who had a copy of my *Moondoggle* book. Would I be available for an interview to present the contrarian side? The program would run from about 11 p.m. my time to 5

Continued on page 62

Number 60 on your Feedback card

PROPAGATION

Jim Gray W1XU/7
210 E Chateau Circle
Payson AZ 85541

December

Season's Greetings!

DXers can look forward to reasonably Good (G) radio propagation between the 9th and 17th; Fair (F) DX on the 19th. 20th, 23rd, 24th, and 28th; and Poor (P) or Very Poor (VP) propagation, with an upset to active geomagnetic field and a disturbed ionosphere on the 3rd through the 6th, and again on the 29th. The remaining days show trending conditions (see calendar).

Although winter DX propagation on the HF bands above 20 meters is generally poorer than in the Spring or Fall, because excitation of the E and F layers in the ionosphere is less, the solar flux index is expected to be up around the 200 level at this part of the sunspot cycle and DX propagation ought to be much better than it was last December.

Please pay particular attention to weather conditions December 3rd through the 6th, and again on or about the 30th, when severe winter storms could occur in parts of the United States. Other geophysical disturbances are also possible here and elsewhere in the world during these three or four days, so be prepared.

Forecasters are undecided about the anticipated occurrence of Cycle 23's sunspot maximum. Some predict it will occur sometime in the year 2000, while others — including this writer — tend to expect it sometime in 2001. Contrary to earlier expectations (and hopes) among radio amateurs, Cycle 23 is likely to rank as less than average, or poor, compared to previous recent cycles.

Nevertheless, the gradual decline of a cycle takes place over a period of five or six years until its sunspot minimum, so we still have a lot of good DX to look forward to in Cycle 23.

January 2000

Happy New Year!

As you can see from the calendar, January will provide everything from Good (G) to Very Poor (VP) radio propagation conditions on the HF bands.

Briefly, you may expect seasonally good (G) propagation from January 1-10, but conditions are expected to deteriorate for the next three weeks, ranging from only Fair (F) to Very Poor (VP).

The worst days are anticipated January 14–16, 23–25, and 28–30, when a disturbed magnetic field and ionospheric storms are likely. Severe signal fading and even short-lived communications "blackouts" over polar propagation paths may be expected on HF bands above 40 meters. Prepare for other geophysical effects, such as severe winter weather in the northern hemisphere, during (P) and (VP) periods.

The best advice is to *be prepared* with emergency power, food, water, and warm clothing, and continue to monitor WWV at eighteen minutes after any hour for the latest reports of Solar Flux, BA, and BK indices.

The 80-75 and 40-30 meter bands should provide some good, low-noise activity in the US, Canada, and South/Central America, but DX will depend on a relatively quiet magnetic field. On the poor days, however, don't despair, since transequatorial skip and over-the-poles signals will be present. The polar paths will be weak and full of echoes, whereas the transequatorial path will provide stronger signals, sometimes even on poor days.

The 160 meter band ought to be good for much of the month, so watch the calendar for the

December 1999

SUN	MON	TUE	WED	THU	FRI	SAT
			1 G-F	2 F-P	3 P-VP	4 VP
5 VP-P	6 P	7 P-F	8 F-G	9 G	10 G	11 G
12 G	13 G	14 G	15 G	16 G	17 G	18 G-F
19 F	20 F	21 F-G	22 G-F	23 F	24 F	25 F-G
26 G	27 G-F	28 F	29 F-P	30 P	31 P-F	

EASTERN UNITED STATES TO:

GMT:		02	04	06	08	10	12	14	16	18	20	22
ALASKA	15	20					20	20				15
ARGENTINA	20	40	40	40			20	15	15	10	10	15
AUSTRALIA	15	20	20		40	40	40			20	20	15
CENTRAL AM.	20	20	20	20	20	20	20	15	10	10	15	15
ENGLAND	40	40	40*	40*		20	15	10	15	20	20	
HAWAII	15	20					20	20	20	10	10	15
INDIA							20	20				
JAPAN	15	20					20	20				15
MEXICO	20	20	20	20	20	20	20	15	10	10	15	15
PHILIPPINES							20	20				
PUERTO RICO	20	20	20	20	20	20	20	15	10	10	15	15
RUSSIA (C.I.S.)							20	15	20	20		
SOUTH AFRICA	20	40*					20	10	10	10	15	20
WEST COAST	15/20	20/40	80	160	160	160				10	10	15

CENTRAL UNITED STATES TO:

GMT:		02	04	06	08	10	12	14	16	18	20	22
ALASKA	15							20				15
ARGENTINA	20	20	20	40	40		20	20	15	10	15	15
AUSTRALIA	15	20	20				40				15	10
CENTRAL AM.	15	20	40	40*	40*		20	15	10	10	10	15
ENGLAND	40	40	80					20	15	15	20	40
HAWAII	15	20		40	40	40*	40*	20	20	15	10	15
INDIA								20				
JAPAN	15							20				15
MEXICO	15	20	40	40*	40*		20	15	10	10	10	15
PHILIPPINES	15	20						20				15
PUERTO RICO	15	20	40	40*	40*		20	15	10	10	10	15
RUSSIA (C.I.S.)								20	15	20		
SOUTH AFRICA	20	40						15	10	10	15	20

WESTERN UNITED STATES TO:

GMT:		02	04	06	08	10	12	14	16	18	20	22
ALASKA	10	15	20				40	40	40			20
ARGENTINA	15	20		40	40			20		10	10	15
AUSTRALIA	10	15	20	20			40*	40*	20	20	15	15
CENTRAL AM.	15	20	20					20	15	10	10	10
ENGLAND	20	40	40						15	15	20	20
HAWAII	10	15	20	40	40	40		20	20	15	15	10
INDIA		15	20						20			
JAPAN	10	15	20				40	40	40			20
MEXICO	16	20	20					20	15	10	10	10
PHILIPPINES	10	15/20	15/20			40	40	40		20		20
PUERTO RICO	15	20	20				40	40	40			20
RUSSIA (C.I.S.)									20	20		
SOUTH AFRICA	20	20							15	10	15	15
EAST COAST	15/20	20/40	80	160	160	160				10	10	15

Table 1. December Band-Time-Country chart.

January 2000						
SUN	MON	TUE	WED	THU	FRI	SAT
						1 G
2 G	3 G	4 G	5 G	6 G	7 G-F	8 F
9 F-G	10 G	11 G-F	12 F	13 F-P	14 P-VP	15 VP-P
16 P	17 P-F	18 F	19 F-P	20 P-F	21 F	22 F-P
23 P	24 P-VP	25 VP-P	26 P-F	27 F-P	28 P-VP	29 VP-P
30 P	31 P-F					

good and fair days. The 20/18 meter and 15/12 meter bands will suffer the most along with 10 meters this month, so don't expect miracles. Perhaps in February we'll see some improvement, and March ought to get us back on the road to good worldwide DX conditions on all bands. Let's wait and see.

Remember to check the bands above and below the suggested ones for possible DX surprises. It's often a good idea to park your receiver on a seemingly unused frequency and just wait. A DX station is very likely to pop up before any one else hears him, and you can snag a good catch.

Please note that on the Band-Time-Country charts, (*) indicates a possible 80 meter opening. Good hunting! W1XU/7.

EASTERN UNITED STATES TO:												
GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	15					20	20	15	15			15
ARGENTINA	15	15	15	20/40	20/40						10	10
AUSTRALIA	15	15			20	20/40	20	20				
CENTRAL AM.	15	20	20/40	20/40	20/40	20	20	20	15	15	10	10
ENGLAND	40	40	40/30	40/30	40/30			10	10	15	20	40
HAWAII	15	15	20		40							15
INDIA	15	20			20							
JAPAN	15					20	20	15	15			15
MEXICO	15	20	20/40	20/40	20/40	20	20	20	15	15	10	10
PHILIPPINES	20						15			15	15	
PUERTO RICO	15	20	20/40	20/40	20/40	20	20	20	15	15	10	10
RUSSIA (C.I.S.)							20	15	20	20		
SOUTH AFRICA		40		20	20			15	15	15		
WEST COAST	15	20	40/80	40/80	40/80	40/80	80	20	10	10	10	10
CENTRAL UNITED STATES TO:												
ALASKA	15	15				40	20	20	20			
ARGENTINA	10	15	20/40	20/40							15	10
AUSTRALIA	15	15	15	20	20/40	20/40	20	20			15	
CENTRAL AM.	15	20	20/40	20/40	20/40	20	20	20	15	10	10	10
ENGLAND							20	15	10	15	20	
HAWAII	15	15	15	20	20/40	20/40			20			15
INDIA	15	20	20	20								
JAPAN	15	15				40	20	20	20			
MEXICO	15	20	20/40	20/40	20/40	20	20	20	15	10	10	10
PHILIPPINES	15		20	20			20	20	15	15		
PUERTO RICO	15	20	20/40	20/40	20/40	20	20	20	15	10	10	10
RUSSIA (C.I.S.)										20	20	
SOUTH AFRICA			40	20					15	20		
WESTERN UNITED STATES TO:												
ALASKA	15			20	20	20	20/40		20	15		15
ARGENTINA	10	15	15	15	20		20	20				10
AUSTRALIA	10	10	15	15	20	20	20/40	20	20			
CENTRAL AM.	15	15	20/40	20/40	20/40	20		15			10	10
ENGLAND									20	15	20	
HAWAII	10	15	15	20	20/40	20/40	20	20			15	10
INDIA			15					20		15		
JAPAN	15			20	20	20	20/40		20	15		15
MEXICO	15	15	20/40	20/40	20/40	20		15			10	10
PHILIPPINES					20	20	20	20	15	15		
PUERTO RICO	15	15	20/40	20/40	20/40	20		15			10	10
RUSSIA (C.I.S.)								20	20	20		
SOUTH AFRICA				20	20				20	15		
EAST COAST	15	20	40/80	40/80	40/80	40/80	80	20	10	10	10	10

Table 2. January Band-Time-Country chart.

Number 61 on your Feedback card

UPDATES

Professor Lynden McIntyre N8RXL, Sinclair Community College, Dayton OH 45402-1460; E-mail [lmcintyre@sinclair.edu]. I'm sending you a *tested* listing of PICKEY.ASM ("PIC Key, PIC Key," Sept. 1999, pp. 10ff.). Lines 19 and 20 still give a warning, and any changes I tried to make to these lines still gave me a warning or message. These two lines are not an error [as I originally suspected — see "Updates," October 1999, p. 64] and do work as originally printed. One additional fix is a RETURN at the end of the Dot subroutine at line 47. Without this fix, every dot becomes an "A" dit dah. With the previous fixes and this, the PIC keyer now will work OK.

Our thanks and those of other PICKeyers go to N8RXL for following through on this article.— ed.

```
LOC  OBJECT CODE     LINE SOURCE TEXT
  VALUE

                     00001 ;PROGRAM:        PICKEY.ASM
                     00002 ;AUTHOR:         VLADIMIR SKRYPNIK  UY5DJ
                     00003 ;DATE:           SEPTEMBER 15, 1999
                     00004 ;DESCRIPTION:    THIS SIMPLE CW KEYER IS A GREAT WAY
                     00005 ;                TO LEARN ABOUT PICs. 73 SEPT  '99 PG.10
                     00006
                     00007          LIST P=16F84
2007 3FF3            00008          __CONFIG 0X3FF3; RC CLOCK OSCILLATOR
                     00009 ;..................................................
                     00010 ; CPU EQUATES
  00000005           00011 PORTA    EQU     0X05
  00000006           00012 PORTB    EQU     0X06
  0000000C           00013 COUNT1   EQU     0X0C ;FOR DOT DELAY
  0000000D           00014 COUNT2   EQU     0X0D ;FOR PAUSE DELAY
  0000000E           00015 COUNT3   EQU     0X0E ;FOR DASH DELAY
                     00016 ;..................................................
0000                 00017          ORG     0X000
0000 30FF            00018 START    MOVLW   0XFF
Warning[224]: Use of this instruction is not recommended
0001 0065            00019          TRIS    PORTA
0002 3000            00020          MOVLW   0X00
Warning[224]: Use of this instruction is not recommended.
0003 0066            00021          TRIS    PORTB
0004 0186            00022          CLRF    PORTB
                     00023
0005 018C            00024 BEGIN    CLRF    COUNT1
0006 018D            00025          CLRF    COUNT2
0007 018E            00026          CLRF    COUNT3
                     00027 ;..............DOT...............................
0008 1905            00028          BTFSC   PORTA,2
0009 280C            00029          GOTO    DASH?
000A 2010            00030          CALL    DOT
000B 2805            00031          GOTO    BEGIN
                     00032 ;..............DASH..............................
000C 1985            00033 DASH?    BTFSC   PORTA,3
000D 2805            00034          GOTO    BEGIN
000E 201A            00035          CALL    DASH
000F 2805            00036          GOTO    BEGIN
                     00037 ;..............SUBROUTINE DOT......................
0010 1486            00038 DOT      BSF     PORTB,1
0011 300C            00039          MOVLW   D'12'
0012 008C            00040          MOVWF   COUNT1
0013 1586            00041 RPTDOT   BSF     PORTB,3
0014 1186            00042          BCF     PORTB,3
0015 0B8C            00043          DECFSZ  COUNT1,F
0016 2813            00044          GOTO    RPTDOT
0017 1086            00045          BCF     PORTB,1
0018 2024            00046          CALL    PAUSE
0019 0008            00047          RETURN
                     00048 ;..............SUBROUTINE DASH.....................
001A 1486            00049 DASH     BSF     PORTB,1
001B 3025            00050          MOVLW   D'37'
001C 008E            00051          MOVWF   COUNT3
001D 1586            00052 RPTDSH   BSF     PORTB,3
001E 1186            00053          BCF     PORTB,3
001F 0B8E            00054          DECFSZ  COUNT3,F
0020 281D            00055          GOTO    RPTDSH
0021 1086            00056          BCF     PORTB,1
0022 2024            00057          CALL    PAUSE
0023 0008            00058          RETURN
                     00059 ;..............SUBROUTINE PAUSE....................

0024 3000            00060 PAUSE    MOVLW   D'13
0025 008D            00061          MOVWF   COUNT2
0026 0B8D            00062 RPTPAU   DECFSZ  COUNT2,F
0027 2826            00063          GOTO    RPTPAU
0028 0008            00064          RETURN
                     00065
                     00066          END


SYMBOL TABLE
  LABEL                          VALUE

BEGIN                            00000005
COUNT1                           0000000C
COUNT2                           0000000D
COUNT3                           0000000E
DASH                             0000001A
DASH?                            0000000C
DOT                              00000010
PAUSE                            00000024
PORTA                            00000005
PORTB                            00000006
RPTDOT                           00000013
RPTDSH                           0000001D
RPTPAU                           00000026
START                            00000000
__16F84                          00000001
```

Number 64 on your Feedback card

Barter 'n' Buy

Turn your old ham and computer gear into cash now. Sure, you can wait for a hamfest to try and dump it, but you know you'll get a far more realistic price if you have it out where 100,000 active ham potential buyers can see it, rather than the few hundred local hams who come by a flea market table. Check your attic, garage, cellar and closet shelves and get cash for your ham and computer gear before it's too old to sell. You know you're not going to use it again, so why leave it for your widow to throw out? That stuff isn't getting any younger!
The *73* Flea Market, Barter 'n' Buy, costs you peanuts (almost)—comes to 35 cents a word for individual (noncommercial!) ads and $1.00 a word for commercial ads. Don't plan on telling a long story. Use abbreviations, cram it in. But be honest. There are plenty of hams who love to fix things, so if it doesn't work, say so.
Make your list, count the words, including your call, address and phone number. Include a check or your credit card number and expiration. If you're placing a commercial ad, include an additional phone number, separate from your ad.
This is a monthly magazine, not a daily newspaper, so figure a couple months before the action starts; then be prepared. If you get too many calls, you priced it low. If you don't get many calls, too high.
So get busy. Blow the dust off, check everything out, make sure it still works right and maybe you can help make a ham newcomer or retired old timer happy with that rig you're not using now. Or you might get busy on your computer and put together a list of small gear/parts to send to those interested?

Send your ads and payment to: *73 Magazine*, Barter 'n' Buy, 70 Hancock Rd., Peterborough NH 03458 and get set for the phone calls. The deadline for the April 2000 classified ad section is February 10, 2000.

President Clinton probably doesn't have a copy of *Tormet's Electronics Bench Reference* but you should. Check it out at **[www.ohio.net/~rtormet/index.htm]**—over 100 pages of circuits, tables, RF design information, sources, etc. BNB530

Copies - *73* Magazine Nov. '63 thru Dec. '78. *QST* Magazine Nov. '63 thru Dec. '78. *Ham Radio* Magazine Mar. '68 thru July '79. *CQ* Magazine Dec. '64 thru Mar. '79. $2.00 Each Copy plus shipping. W.L. Brown, Box 541, Sullivan's Island SC 29482. Tel. (843) 883-3574. BNB73

RF TRANSISTORS TUBES 2SC2879, 2SC1971, 2SC1972, MRF247, MRF455, MB8719, 2SC1307, 2SC2029, MRF454, 2SC3133, 4CX250B, 12DQ6, 6KG6A, etc. **WESTGATE**, 1-800-213-4563. BNB6000

Cash for Collins: Buy any Collins Equipment. Leo **KJ6HI**. Tel./FAX (310) 670-6969. [radioleo@earthlink.net]. BNB425

MAHLON LOOMIS, INVENTOR OF RADIO, by Thomas Appleby (copyright 1967). Second printing available from **JOHAN K.V. SVANHOLM N3RF**, SVANHOLM RESEARCH LABORATORIES, P.O. Box 81, Washington DC 20044. Please send $25.00 donation with $5.00 for S&H. BNB420

METHOD TO LEARN MORSE CODE FAST AND WITHOUT HANGUPS Johan N3RF. Send $1.00 & **SASE**. SVANHOLM RESEARCH LABORATORIES, P.O. Box 81, Washington DC 20044 USA. BNB421

Great New Reference Manual with over 100 pgs of P/S, transistor, radio, op-amp, antenna designs, coil winding tables, etc. See details at [www.ohio.net/~rtormet/index.htm] or send check or M.O. for $19.95 + $2.00 P&H to RMT Engineering, 6863 Buffham Rd., Seville OH 44273. BNB202

QSL CARDS. Basic Styles; Black and White and Color Picture Cards; Custom Printed. Send 2 stamps for samples and literature. RAUM'S, 8617 Orchard Rd., Coopersburg PA 18036. Phone or FAX (215) 679-7238. BNB519

WANTED: High capacity 12 volt solar panels for repeater. **[kk4ww@fairs.org]** or (540) 763-2321. BNB2630

COLLOIDAL SILVER GENERATOR! Why buy a "box of batteries" for hundreds of dollars? Current regulated, AC powered, fully assembled with #12 AWG silver electrodes, $74.50. Same, but DC powered, $54.50. Add $2.50 shipping. **Thomas Miller**, 314 South 9th Street, Richmond IN 47374. BNB342

ASTRON power supply, brand-new w/ warranty. RS20M $99, RS35M $145, RS50M $209, RS70M $249. **Web:** [www.aventrade.com]. Call for other models. **(626) 286-0118.** BNB411

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TELEGRAPH COLLECTOR'S PRICE GUIDE: 250 pictures/prices. $12 postpaid. **ARTIFAX BOOKS**, Box 88, Maynard MA 01754. Telegraph Museum: [http://wltp.com]. BNB113

Ham Radio Repair, Quality workmanship. All Brands, Fast Service. **Affordable Electronics,** 7110 E. Thomas Rd., Scottsdale, AZ 85251. **Call** 480-970-0963, or E-mail **HAM SERVICE@AOL.COM.** BNB 427

NEVER SAY DIE

continued from page 59

a.m. Sure, no problem. When I do the Art Bell show, I'm on from 1 to 6 a.m.

So I boned up on the most glaring reasons that convinced me that the Apollo trips had to have been faked. The station called at 11 p.m., as promised. Around 11:15, they gave me my first opportunity to talk. I started out by citing the deadly radiation in the Van Allen Belt and that dust without any atmosphere is like concrete, yet the photos supposedly taken on the Moon showed dust kicking up and lots of footprints.

Instead of having me on for the planned six hours of periodic rebuttal they thanked me and quickly hung up. In retrospect, what they expected was an amusing ranting by a crazy.

If It Bleeds

If it bleeds, it leads — that's the TV news motto. Well, the news shows have been trying to outdo each other, so the recent "ethnic cleansing" in Yugoslavia has been great for ratings. Lots of blood. I'm old enough so I remember when we used to call it genocide, but then "cleansing" is a lot cleaner than anything ending in cide.

But when did the US get elected to be the world's policeman, and by whom? I don't recall being consulted.

We sat by during the Ebo genocide in Nigeria, and again in Laos and Cambodia, and again in Rwanda, and Burundi. We didn't even say boo when Mao wiped out about 80 million Chinese teachers and land owners. Nor when Stalin did the same with his teachers and military officers.

So when are we going to invade Sri Lanka, Miramar, Timor and other genocidal areas and put a stop to the cleansing that is going on all around the world? They need us in Guatemala, Peru, and at least 50 other countries, so let's first get our TV reporters out there, then let's follow them up with American soldiers.

Our refusal to invade Tibet and show those damned Chinese what's what is an absolute disgrace, and at least half the countries of Africa are ripe for an invasion.

What we need to do is to get busy and invade these small countries and set them up with proven civilized systems such as we have for educating our children, providing our health care, keeping drugs from our children, and eliminating poverty.

Wise Up!

Here are some of my books which can change your life (if you'll let 'em). If the idea of being healthy, wealthy and wise interests yon, start reading. Yes, yon can be all that, but only when you know the secrets which I've spent a lifetime uncovering.

......*Wayne*

The Bioelectrifier Handbook: This explains how to build or buy ($155) a little electrical gadget that can help clean the blood of any virus, microbe, parasite, fungus or yeast. The process was discovered by scientists at the Albert Einstein College of Medicine, quickly patented, and hushed up. It's curing AIDS, hepatitis C, and a bunch of other serious illnesses. The circuit can be built for under $20 from the instructions in the book. $10 (01)

The Secret Guide to Wisdom: This is a review of around a hundred books that will help you change your life. No, I don't sell these books. They're on a wide range of subjects and will help to make you a very interesting person. Wait'll you see some of the gems you've missed reading. $5 (02)

The Secret Guide to Wealth: Just as with health, you'll find that you have been brainwashed by "the system" into a pattern of life that will keep you from ever making much money and having the freedom to travel and do what you want. I explain how anyone can get a dream job with no college, no résumé, and even without any experience. I explain how you can get someone to happily pay you to learn what you need to know to start your own business. $5 (03)

The Secret Guide to Health: Yes, there really is a secret to regaining your health and adding 30 to 60 years of healthy living to your life. The answer is simple, but it means making some difficult lifestyle changes. Will you be skiing the slopes of Aspen with me when you're 90 or doddering around a nursing home? Or pushing up daisies? No, I'm not selling any health products. $5 (04)

My WWII Submarine Adventures: Yes, I spent from 1943-1945 on a submarine, right in the middle of the war with Japan. We almost got sunk several times, and twice I was in the right place at the right time to save the boat. What's it really like to be depth charged? And what's the daily life aboard a submarine like? How about the Amelia Earhart inside story?If you're near Mobile, please visit the Drum. $5 (10)

Travel Diaries: You can travel amazingly inexpensively – once you know the ropes.Enjoy Sherry and my budget visits to Europe, Russia, and a bunch of other interesting places. How about a first class flight to Munich, a rented Audi, driving to visit Vienna, Krakow in Poland (and the famous salt mines), Prague, back to Munich, and the first class flight home for two, all for under $1,000. Yes, when you know how you can travel inexpensively, and still stay in first class hotels. $5 (11)

Wayne's Caribbean Adventures: More budget travel stories – where I visit the hams and scuba dive most of the islands of the Caribbean. Like the special Liat fare which allowed us to visit 11 countries in 21 days, with me diving all but one of the islands, Guadeloupe, where the hams kept me too busy with parties. $5 (12)

Cold Fusion Overview: This is both a brief history of cold fusion, which I predict will be one of the largest industries in the world in the 21st century, plus a simple explanation of how and why it works. This new field is going to generate a whole new bunch of billionaires, just as the personal computer industry did. $5 (20)

Cold Fusion Journal: They laughed when I predicted the PC industry growth in 1975. PCs are now the third largest industry in the world. The cold fusion ground floor is still wide open, but then that might mean giving up watching ball games. Sample: $10 (22).

Julian Schwinger: A Nobel lauriate's talk about cold fusion— confirming its validity. $2 (24)

Improving State Government: Here are 24 ways that state governments can cut expenses enormously, while providing far better service. I explain how any government bureau or department can be gotten to cut it's expenses by at least 50% in three years and do it cooperatively and enthusiastically. I explain how, by applying a new technology, the state can make it possible to provide all needed services without having to levy *any* taxes at all! Read the book, run for your legislature, and let's get busy making this country work like its founders wanted it to. Don't leave this for "someone else" to do. $5 (30)

Mankind's Extinction Predictions: If any one of the experts who have written books predicting a soon-to-come catastrophe which will virtually wipe us all out are right, we're in trouble. In this book I explain about the various disaster scenarios, from Nostradamus, who says the poles will soon shift, wiping out 97% of mankind, to Sai Baba, who has recently warned his followers to get out of Japan and Australia before December 6th this year. The worst part of these predictions is the accuracy record of some of the experts. Will it be a pole shift, a new ice age, a massive solar flare, a comet or asteroid, a bioterrorist attack, or even Y2K? I'm getting ready, how about you? $5 (31)

Moondoggle: After reading René's book, *NASA Mooned America*, I read everything I could find on our Moon landings. I watched the videos, looked carefully at the photos, read the astronaut's biographies, and talked with some of my readers who worked for NASA. This book cites 25 good reasons I believe the whole Apollo program had to have been faked. $5 (30)

Classical Music Guide: A list of 100 CDs which will provide you with an outstanding collection of the finest classical music ever written. This is what you need to help you reduce stress. Classical music also raises youngster's IQs, helps plants grow faster, and will make you healthier. Just wait'll you hear some of Gotschalk's fabulous music! $5 (33)

The Radar Coverup: Is police radar dangerous? Ross Adey K6UI, a world authority, confirms the dangers of radio and magnetic fields. $3 (34)

Three Gatto Talks: A prize-winning teacher explains what's wrong with American schools and why our kids are not being educated. Why are Swedish youngsters, who start school at 7 years of age, leaving our kids in the dust? Our kids are intentionally being dumbed down by our school system — the least effective and most expensive in the world. $5 (35)

Aspartame: a.k.a. NutraSweet, the stuff in diet drinks, etc., can cause all kinds of serious health problems. Multiple sclerosis, for one. Read all about it, three pamphlets for a buck. (38)

One Hour CW: Using this sneaky method even *you* can learn the Morse Code in one hour and pass that dumb 5wpm Tech-Plus ham test. $5 (40)

Code Tape (T5): This tape will teach you the letters, numbers and punctuation you need to know if you are going on to learn the code at 13 or 20 wpm. $5 (41)

Code Tape (T13): Once you know the code for the letters (41) you can go immediately to copying 13 wpm code (using my system). This should only take two or three days. $5 (42)

Code Tape (T20): Start right out at 20 wpm and master it in a weekend for your Extra Class license. $5 (43)

Wayne Talks Not at Dayton: This is a 90-minute tape of the talk I'd have given at the Dayton, if invited. $5 (50)

Wayne Talks at Tampa: This is the talk I gave at the Tampa Global Sciences conference. I cover cold fusion, amateur radio, health, books you should read, and so on. $5 (51)

$1 Million Sales Video: How to generate extra million in sales using PR. This will be one of the best investments your business ever made. $43 (52)

Reprints of My Editorials from *73*.

Grist I: 50 of my best non-ham oriented editorials from before 1997. $5 (71)

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1997 Editorials: 148 pages. 216 editorials discussing health, ideas for new businesses, exciting new books I've discovered, ways to cure our country's more serious problems, flight 800, the Oklahoma City bombing, more Moon madness, and so on. $10 (74)

1998 Editorials: 168 pages that'll give you lots of controversial things to talk about on the air. $10 (75)

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Wayne's Bell Saver Kit. The cable and instructions enabling you to inexpensively tape Art Bell W6OBB's nightly 5-hr radio talk show. $5 (83)

Stuff I didn't write, but you need:

NASA Mooned America: René makes an air-tight case that NASA faked the Moon landings. This book will convince even you. $25 (90)

Last Skeptic of Science: This is René's book where he debunks a bunch of accepted scientific beliefs – such as the ice ages, the Earth being a magnet, the Moon causing the tides, and etc. $25 (91)

Dark Moon: 568 pages of carefully researched proof that the Apollo Moon landings were a hoax. $35 (92)

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